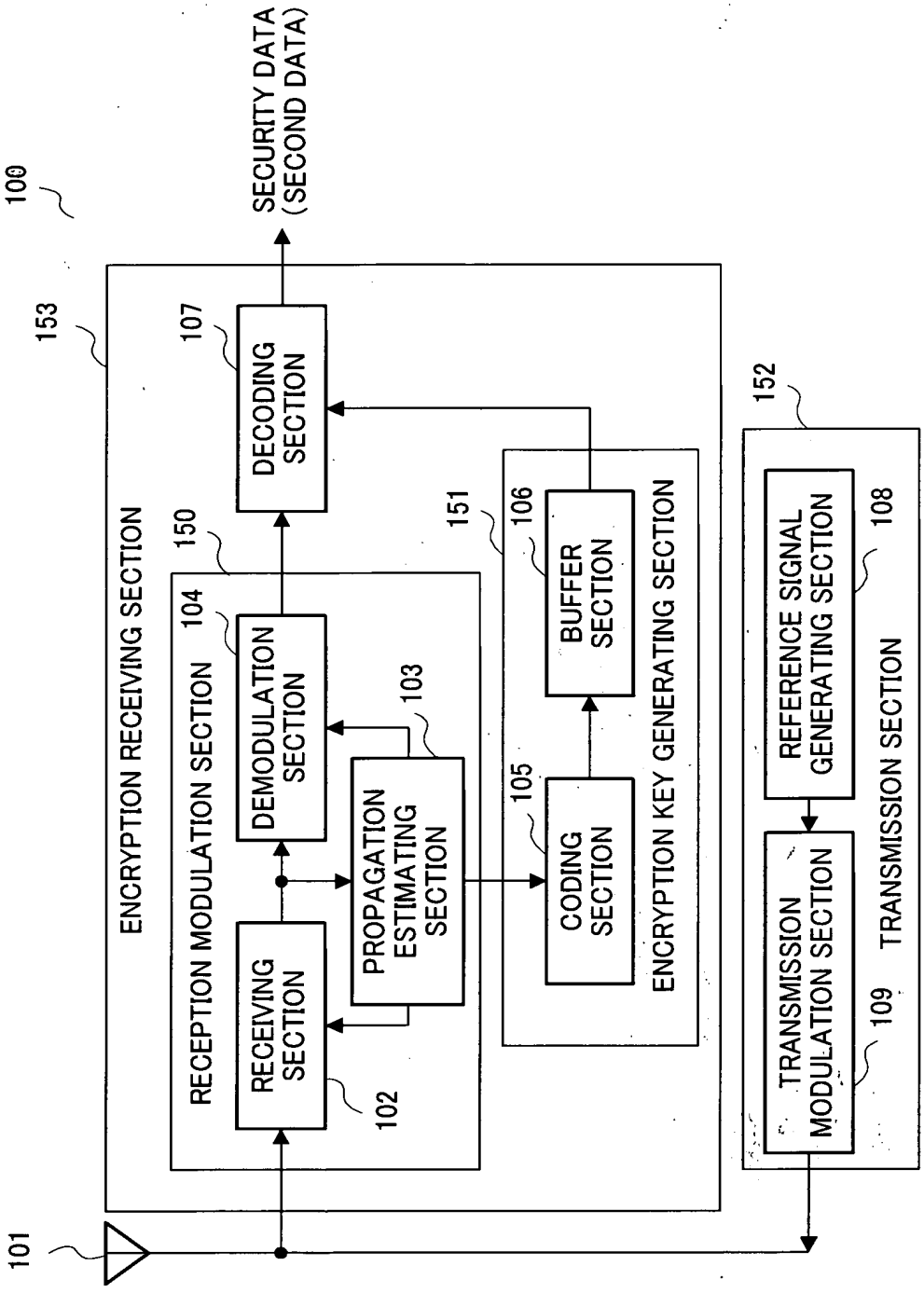
100
SECURITY DATA
(SECOND DATA)
153
ENCRYPTION RECEIVING SECTION
107
DECODING
SECTION
150
RECEPTION MODULATION SECTION
104
DEMODULATION
SECTION
103
PROPAGATION
ESTIMATING
SECTION
RECEIVING
SECTION
102
151
106
BUFFER
SECTION
105
CODING
SECTION
ENCRYPTION KEY GENERATING SECTION
152
108
REFERENCE SIGNAL
GENERATING SECTION
TRANSMISSION
MODULATION SECTION
109
TRANSMISSION SECTION
101

FIG.1

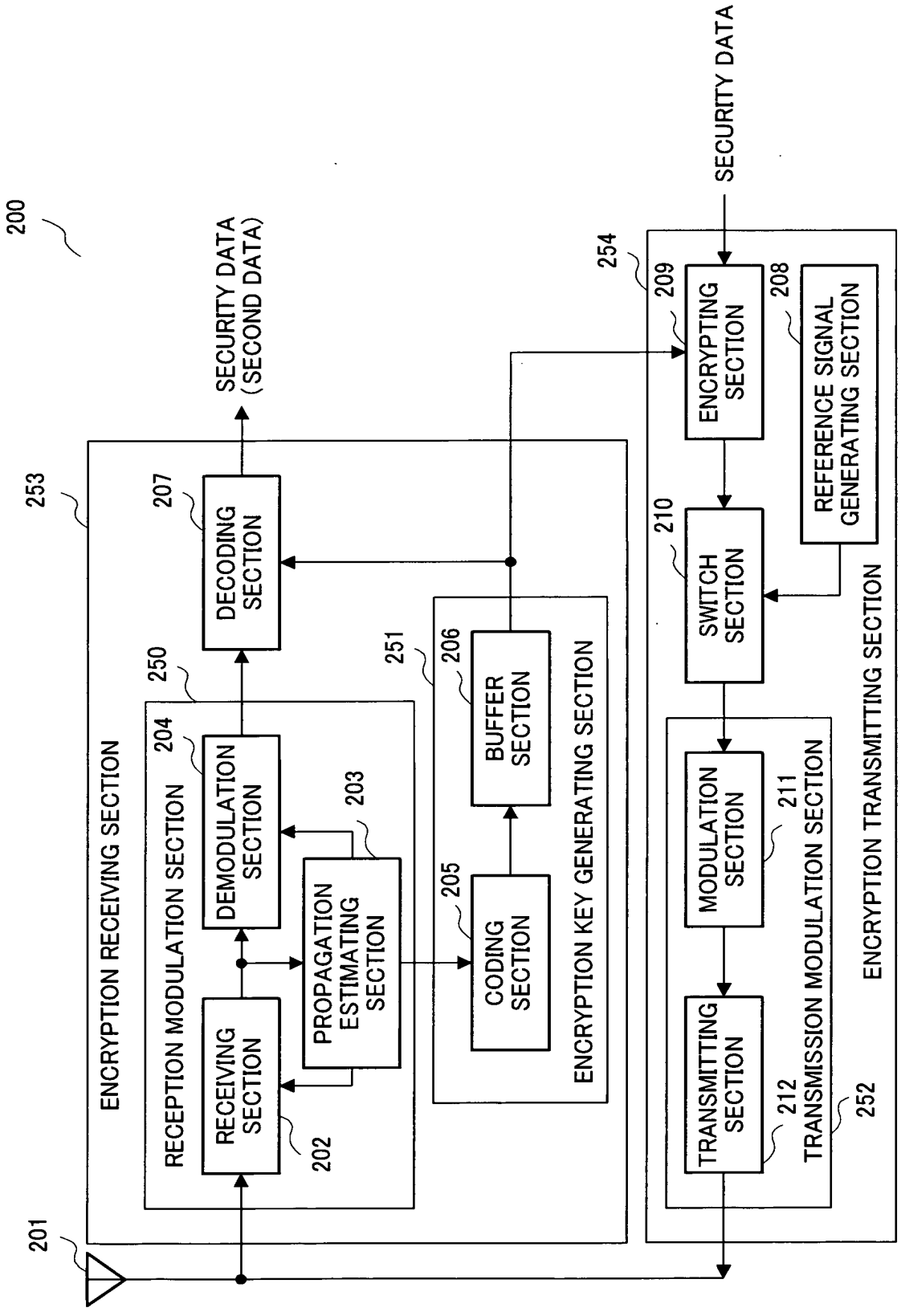
200
SECURITY DATA
SECURITY DATA (SECOND DATA)
253
ENCRYPTION RECEIVING SECTION
207
DECODING SECTION
250
RECEPTION MODULATION SECTION
204
DEMODULATION SECTION
203
PROPAGATION ESTIMATING SECTION
202
RECEIVING SECTION
201
251
ENCRYPTION KEY GENERATING SECTION
206
BUFFER SECTION
205
CODING SECTION
254
ENCRYPTION TRANSMITTING SECTION
209
ENCRYPTING SECTION
208
REFERENCE SIGNAL GENERATING SECTION
210
SWITCH SECTION
211
MODULATION SECTION
212
TRANSMITTING SECTION
TRANSMISSION MODULATION SECTION
252

FIG.2

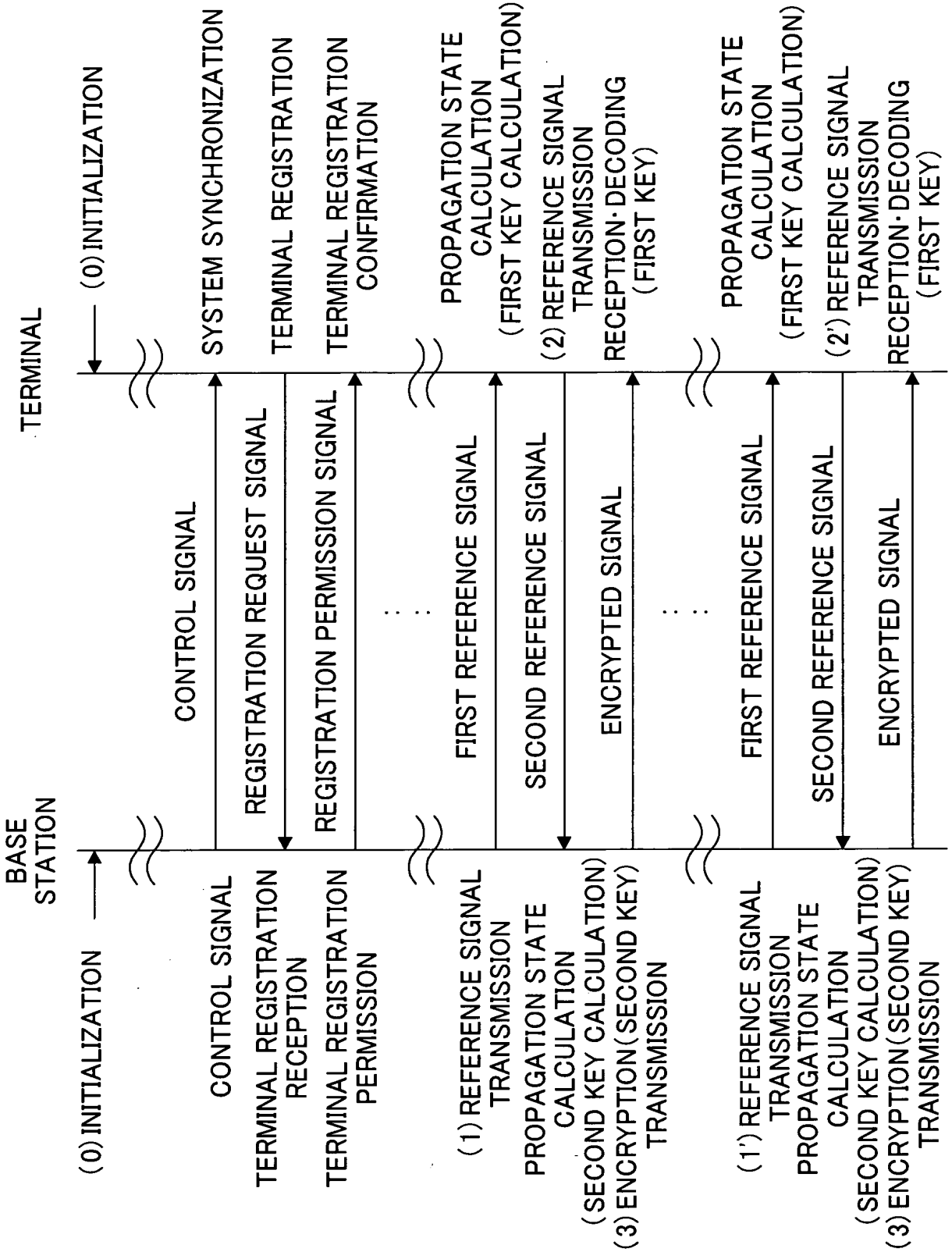
BASE STATION
TERMINAL
(0) INITIALIZATION
(0) INITIALIZATION
CONTROL SIGNAL
SYSTEM SYNCHRONIZATION
CONTROL SIGNAL
REGISTRATION REQUEST SIGNAL
TERMINAL REGISTRATION
TERMINAL REGISTRATION RECEPTION
REGISTRATION PERMISSION SIGNAL
TERMINAL REGISTRATION CONFIRMATION
TERMINAL REGISTRATION PERMISSION
(1) REFERENCE SIGNAL TRANSMISSION
FIRST REFERENCE SIGNAL
PROPAGATION STATE CALCULATION
PROPAGATION STATE CALCULATION (FIRST KEY CALCULATION)
SECOND REFERENCE SIGNAL
(2) REFERENCE SIGNAL TRANSMISSION RECEPTION·DECODING (FIRST KEY)
(SECOND KEY CALCULATION)
ENCRYPTED SIGNAL
(3) ENCRYPTION(SECOND KEY) TRANSMISSION
(1') REFERENCE SIGNAL TRANSMISSION
FIRST REFERENCE SIGNAL
PROPAGATION STATE CALCULATION
PROPAGATION STATE CALCULATION (FIRST KEY CALCULATION)
SECOND REFERENCE SIGNAL
(2') REFERENCE SIGNAL TRANSMISSION RECEPTION·DECODING (FIRST KEY)
(SECOND KEY CALCULATION)
ENCRYPTED SIGNAL
(3) ENCRYPTION(SECOND KEY) TRANSMISSION

FIG.3

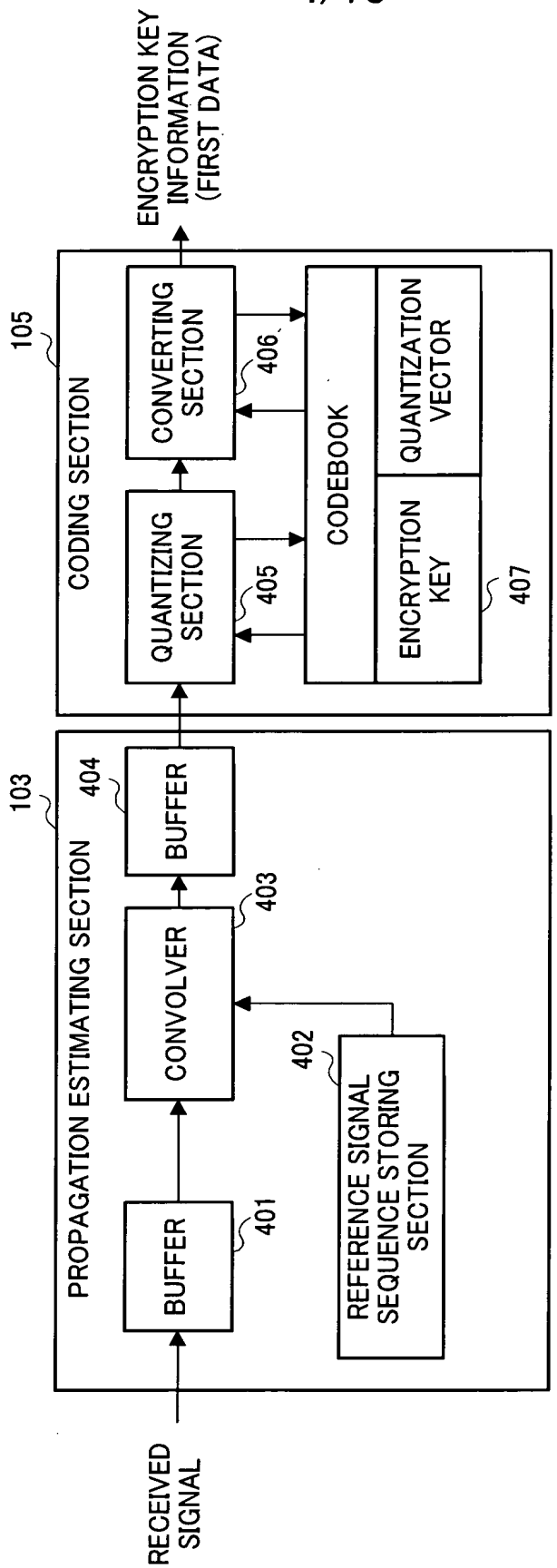
RECEIVED SIGNAL
103
PROPAGATION ESTIMATING SECTION
BUFFER
401
CONVOLVER
403
BUFFER
404
REFERENCE SIGNAL SEQUENCE STORING SECTION
402
105
CODING SECTION
QUANTIZING SECTION
405
CONVERTING SECTION
406
CODEBOOK
ENCRYPTION KEY
407
QUANTIZATION VECTOR
ENCRYPTION KEY INFORMATION (FIRST DATA)

FIG.4

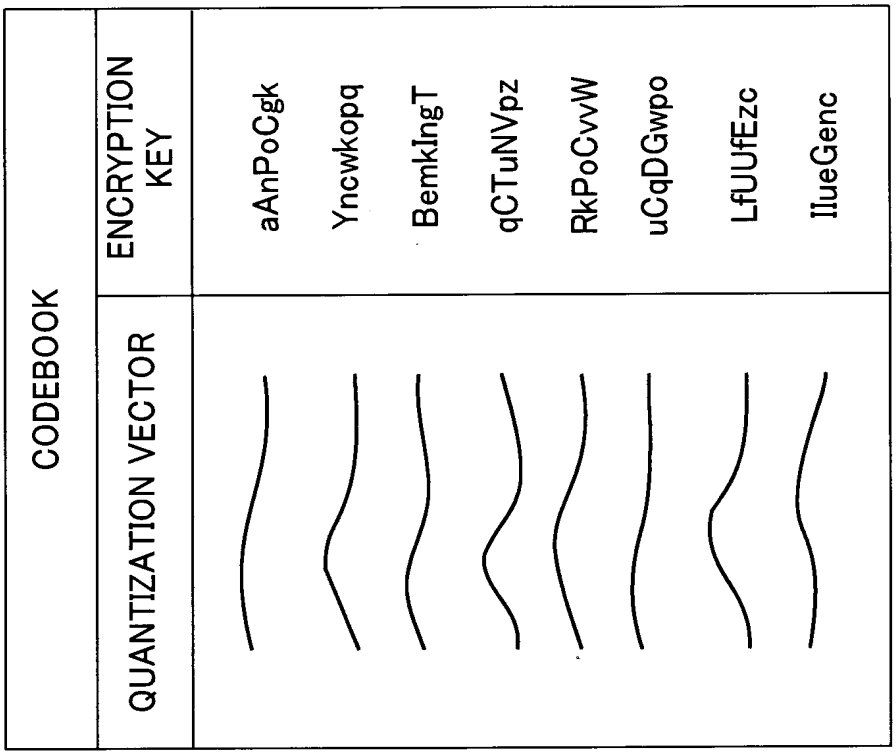
CODEBOOK
QUANTIZATION VECTOR
ENCRYPTION KEY
aAnPoCgk
Yncwkopq
BemkIngT
qCTuNVpz
RkPoCvvW
uCqDGwpo
LfUUfEzc
IlueGenc

FIG.5

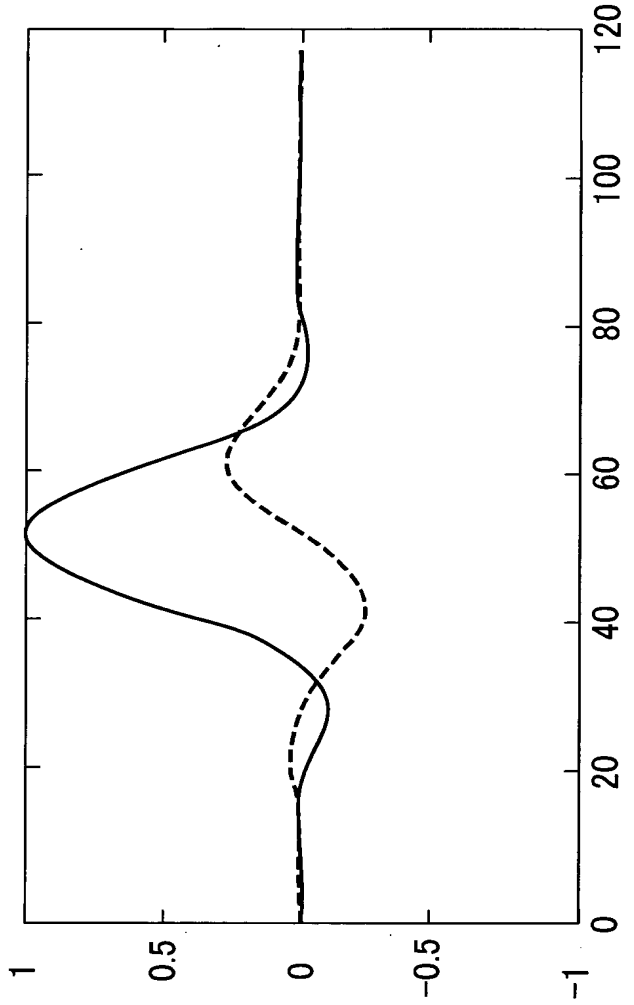

FIG.6

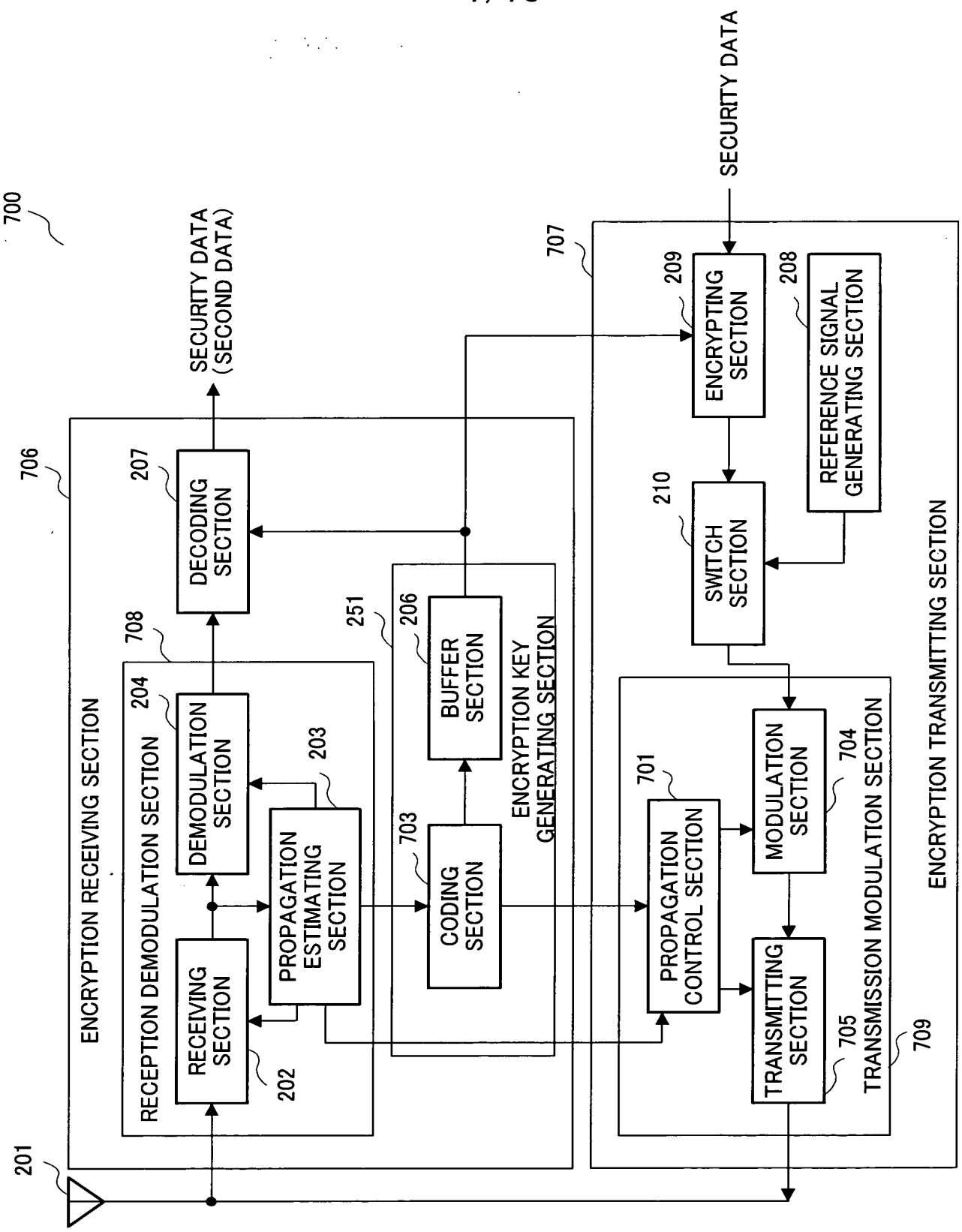
700
SECURITY DATA
SECURITY DATA (SECOND DATA)
707
209
ENCRYPTING SECTION
208
REFERENCE SIGNAL GENERATING SECTION
706
207
DECODING SECTION
210
SWITCH SECTION
708
251
206
BUFFER SECTION
ENCRYPTION KEY GENERATING SECTION
204
DEMODULATION SECTION
203
PROPAGATION ESTIMATING SECTION
703
CODING SECTION
701
PROPAGATION CONTROL SECTION
704
MODULATION SECTION
RECEIVING SECTION
202
TRANSMITTING SECTION
705
709
ENCRYPTION RECEIVING SECTION
RECEPTION DEMODULATION SECTION
TRANSMISSION MODULATION SECTION
ENCRYPTION TRANSMITTING SECTION
201

FIG.7

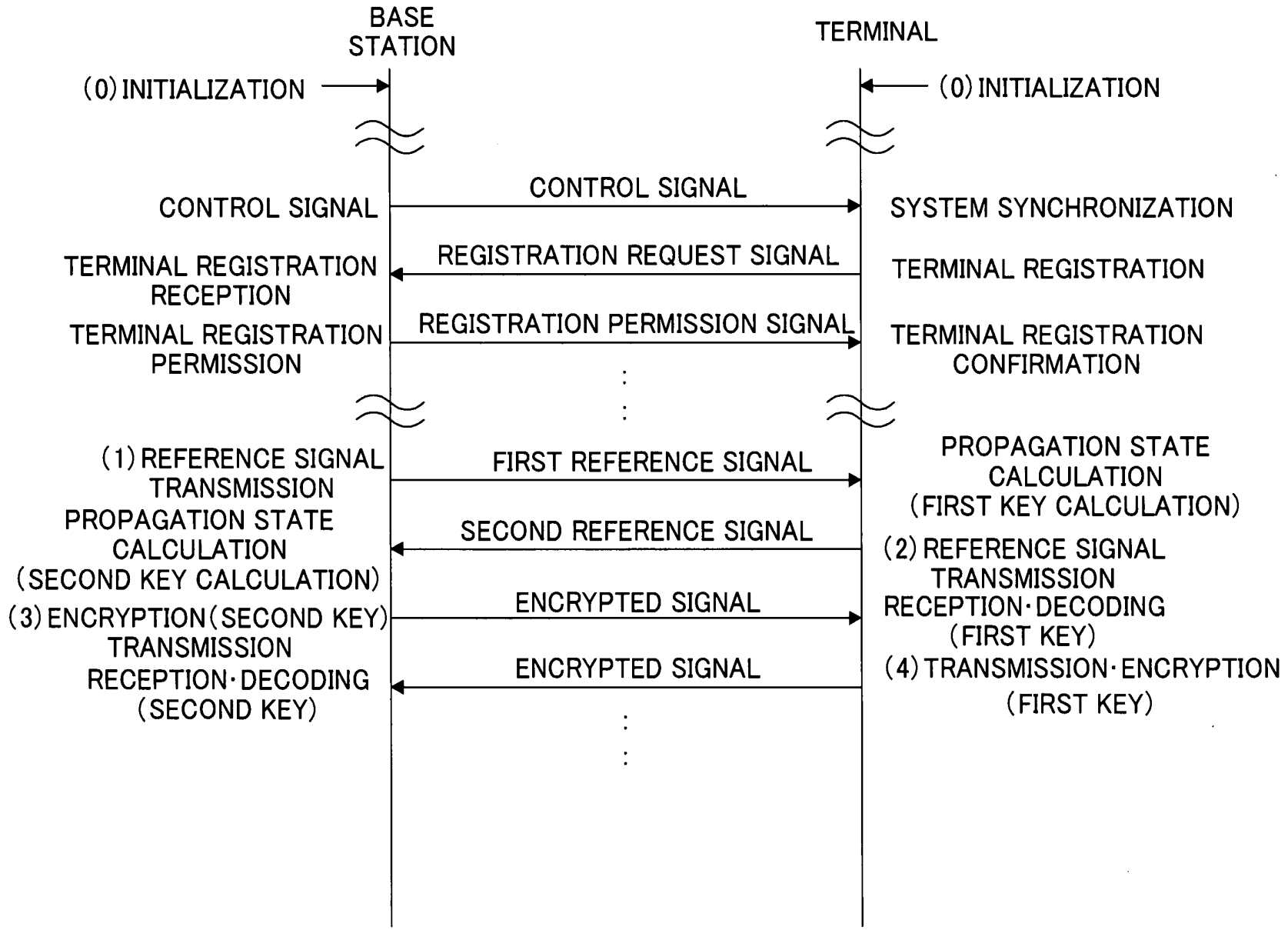

FIG.8

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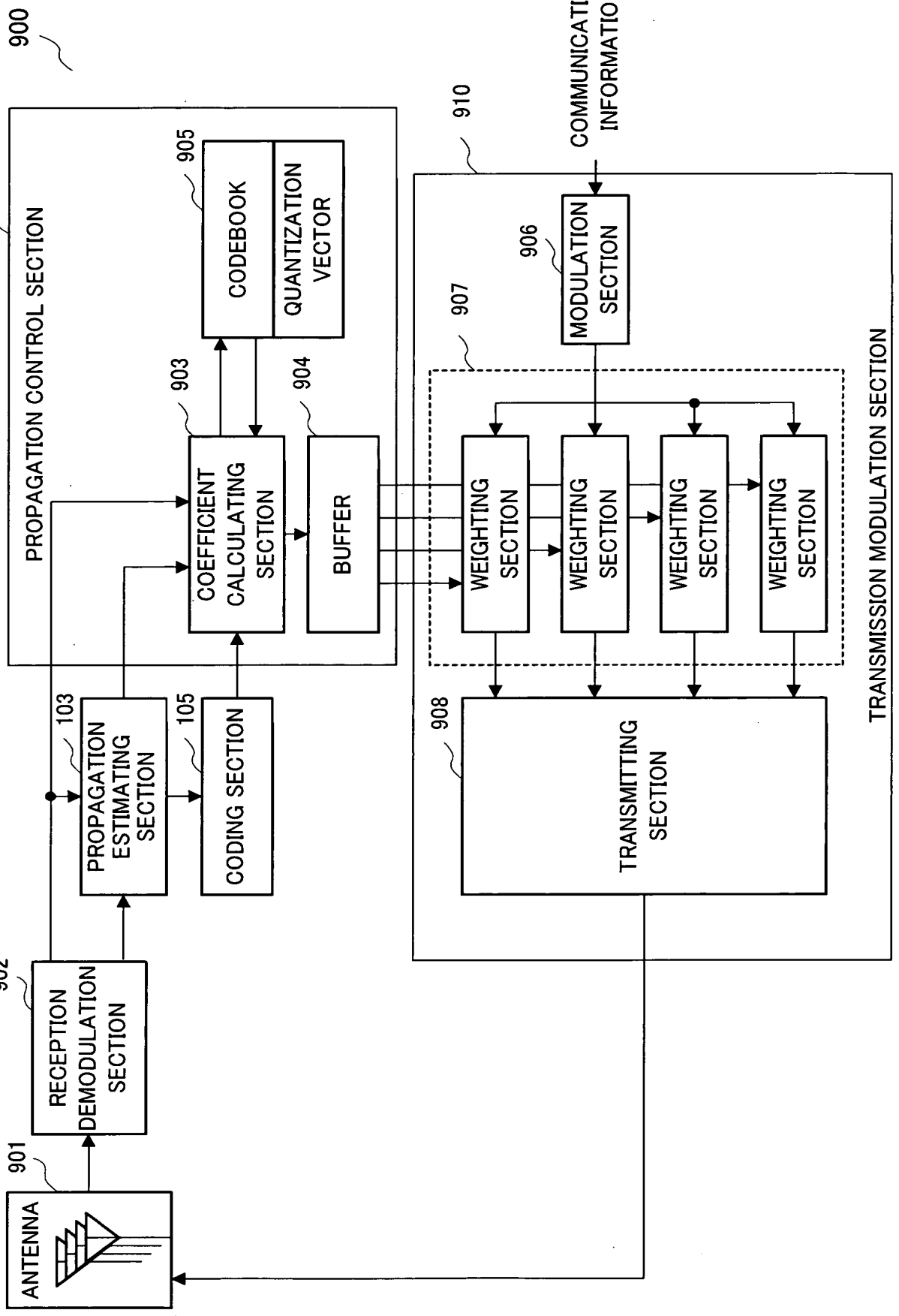

FIG.9

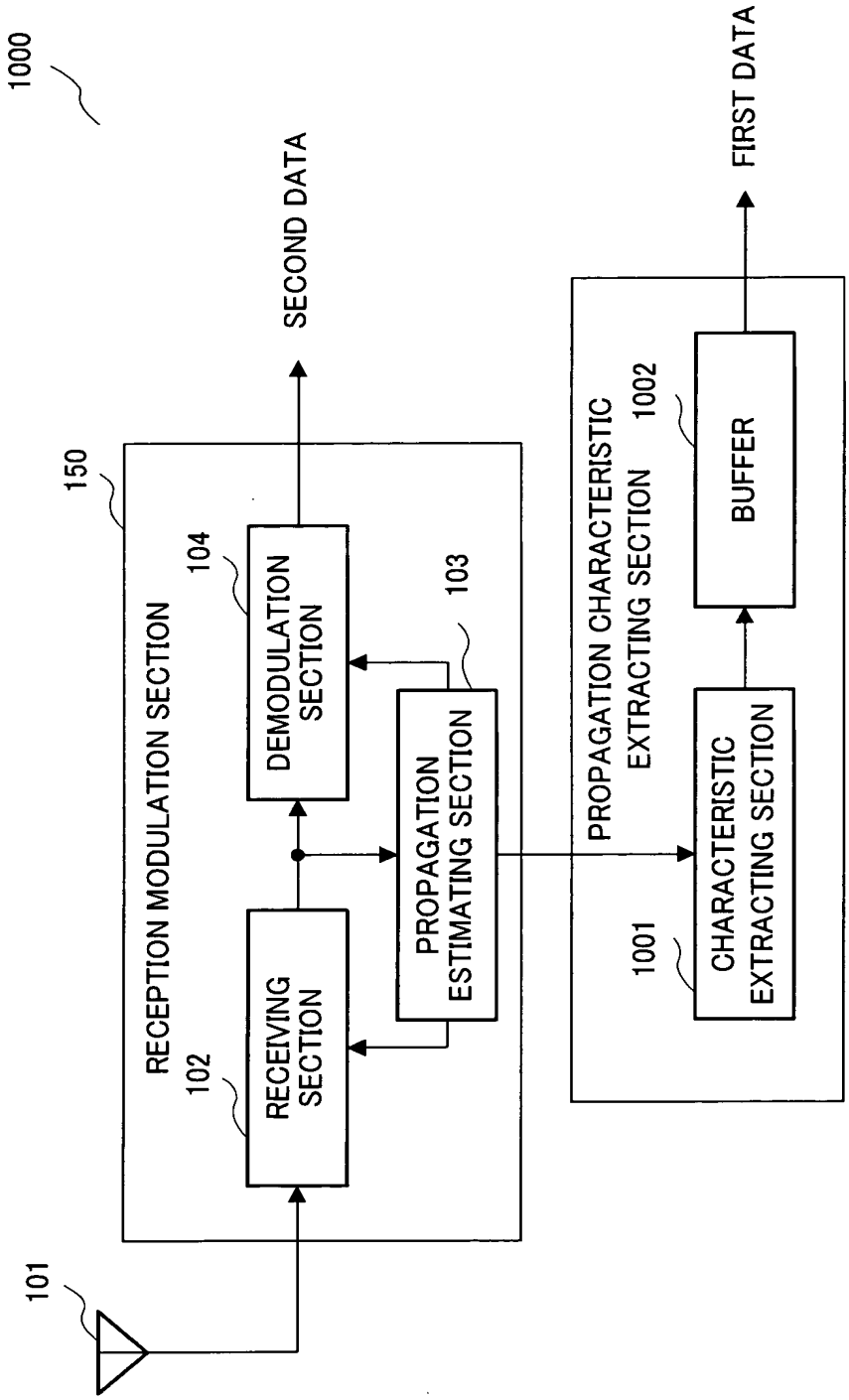
1000
SECOND DATA
FIRST DATA
150
RECEPTION MODULATION SECTION
104
DEMODULATION SECTION
103
PROPAGATION ESTIMATING SECTION
102
RECEIVING SECTION
PROPAGATION CHARACTERISTIC EXTRACTING SECTION
1002
BUFFER
1001
CHARACTERISTIC EXTRACTING SECTION
101

FIG.10

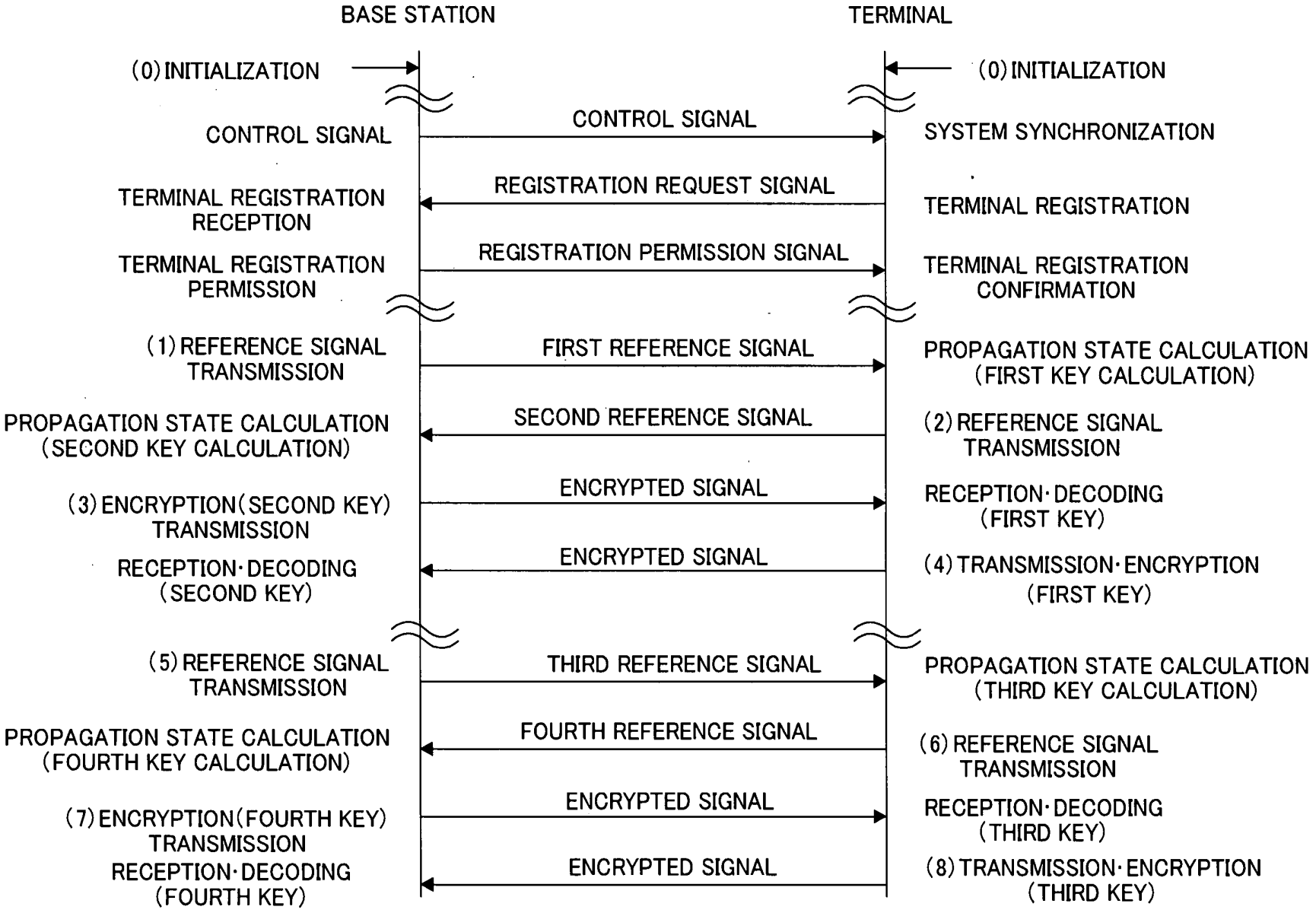

FIG.11

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FRAME STRUCTURE(a)

REFERENCE SIGNAL	DATA (ENCRYPTED INFORMATION)	DATA (ENCRYPTED INFORMATION)	REFERENCE SIGNAL	DATA (ENCRYPTED INFORMATION)

FRAME STRUCTURE(b)

...	REFERENCE SIGNAL	DATA (ENCRYPTED INFORMATION)	REFERENCE SIGNAL	DATA (ENCRYPTED INFORMATION)	REFERENCE SIGNAL	...

FRAME STRUCTURE(c)

...	REFERENCE SIGNAL (K1)	DATA (ENCRYPTED INFORMATION:K0)	...	REFERENCE SIGNAL (K2)	DATA (ENCRYPTED INFORMATION:K1)	...	REFERENCE SIGNAL (K3)	DATA (ENCRYPTED INFORMATION:K2)	...

FIG.12

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COMMUNICATION TRANSITION
CONTROL SCHEME
(1a)
(2a)
(3a)
(4a)
(5a)
REFERENCE SIGNAL
DATA (ENCRYPTED INFORMATION)
DATA (ENCRYPTED INFORMATION)
REFERENCE SIGNAL
DATA (ENCRYPTED INFORMATION)
PROPAGATION CONTROL FOR ENCRYPTION KEY
PROPAGATION CONTROL FOR DATA COMMUNICATION
PROPAGATION CONTROL FOR ENCRYPTION KEY
PROPAGATION CONTROL FOR DATA COMMUNICATION
PROPAGATION CONTROL FOR ENCRYPTION KEY
COMMUNICATION TRANSITION
CONTROL SCHEME
(1b)
(2b)
(3b)
REFERENCE SIGNAL
DATA (ENCRYPTED INFORMATION)
REFERENCE SIGNAL
DATA (ENCRYPTED INFORMATION)
PROPAGATION CONTROL FOR ENCRYPTION KEY
PROPAGATION CONTROL FOR DATA COMMUNICATION
PROPAGATION CONTROL FOR ENCRYPTION KEY
PROPAGATION CONTROL FOR DATA COMMUNICATION

FIG.13

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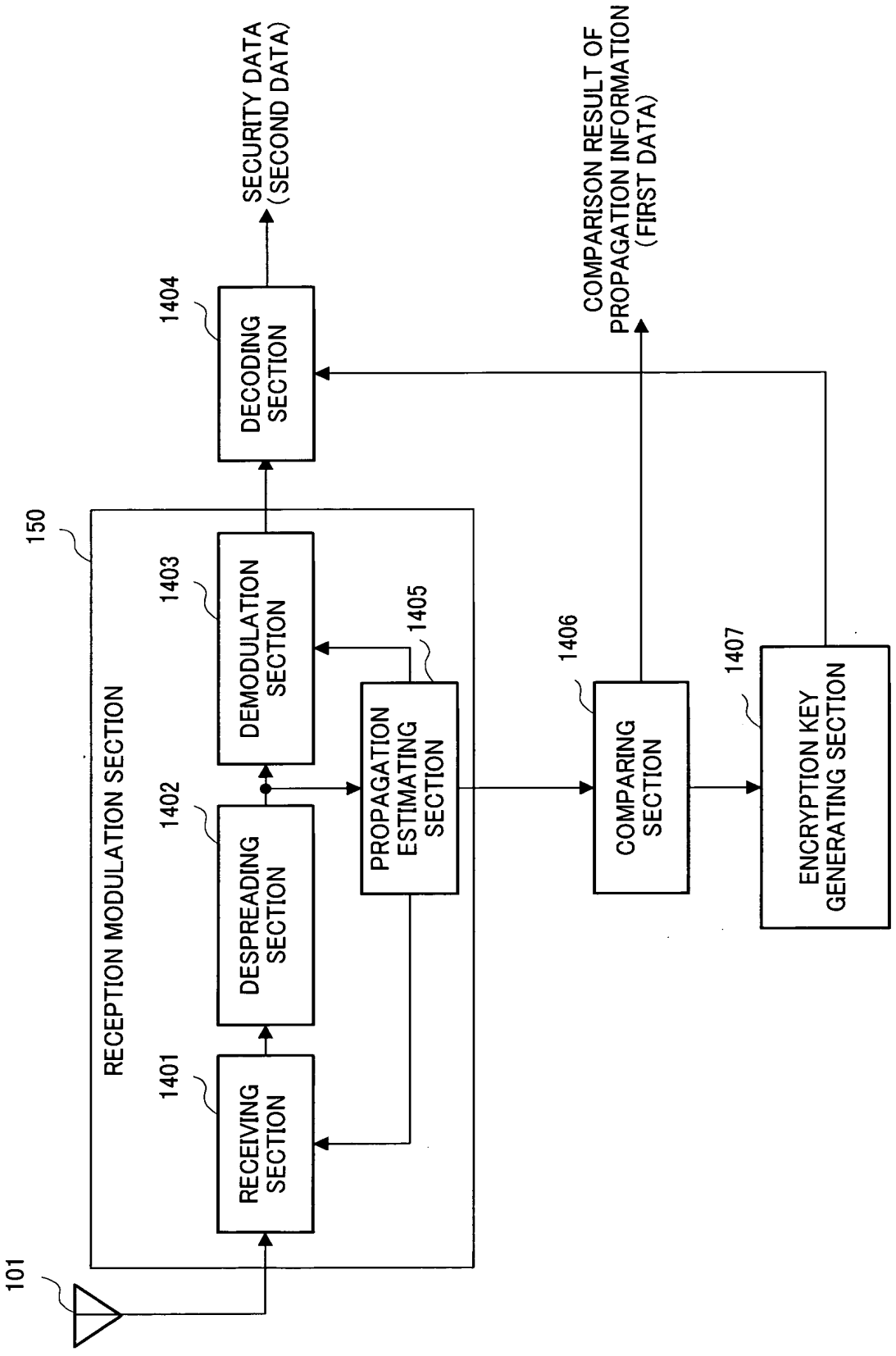

FIG.14

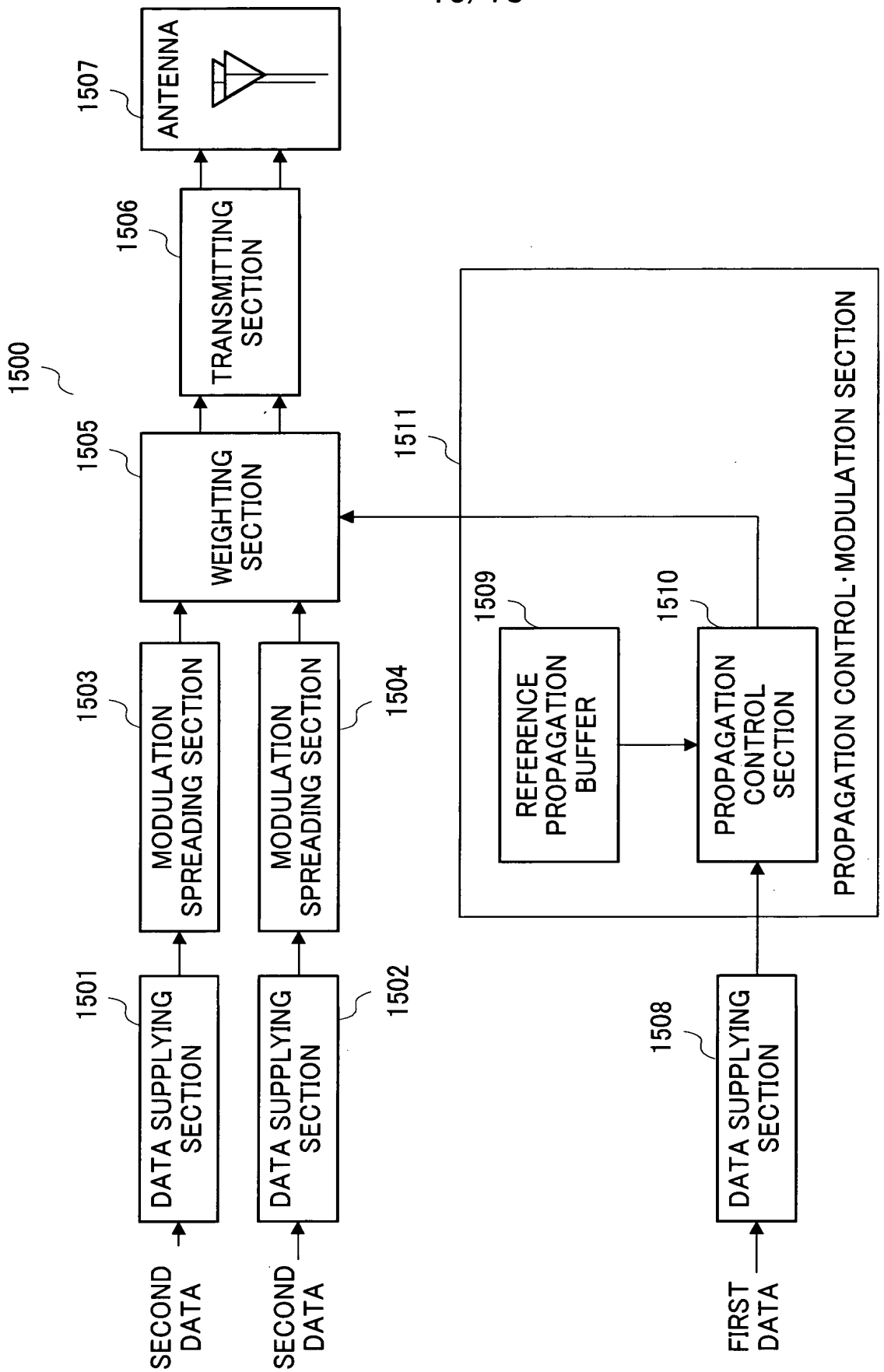
1500
1501
DATA SUPPLYING SECTION
1502
DATA SUPPLYING SECTION
1503
MODULATION SPREADING SECTION
1504
MODULATION SPREADING SECTION
1505
WEIGHTING SECTION
1506
TRANSMITTING SECTION
1507
ANTENNA
1508
DATA SUPPLYING SECTION
1509
REFERENCE PROPAGATION BUFFER
1510
PROPAGATION CONTROL SECTION
1511
PROPAGATION CONTROL·MODULATION SECTION
SECOND DATA
SECOND DATA
FIRST DATA

FIG.15

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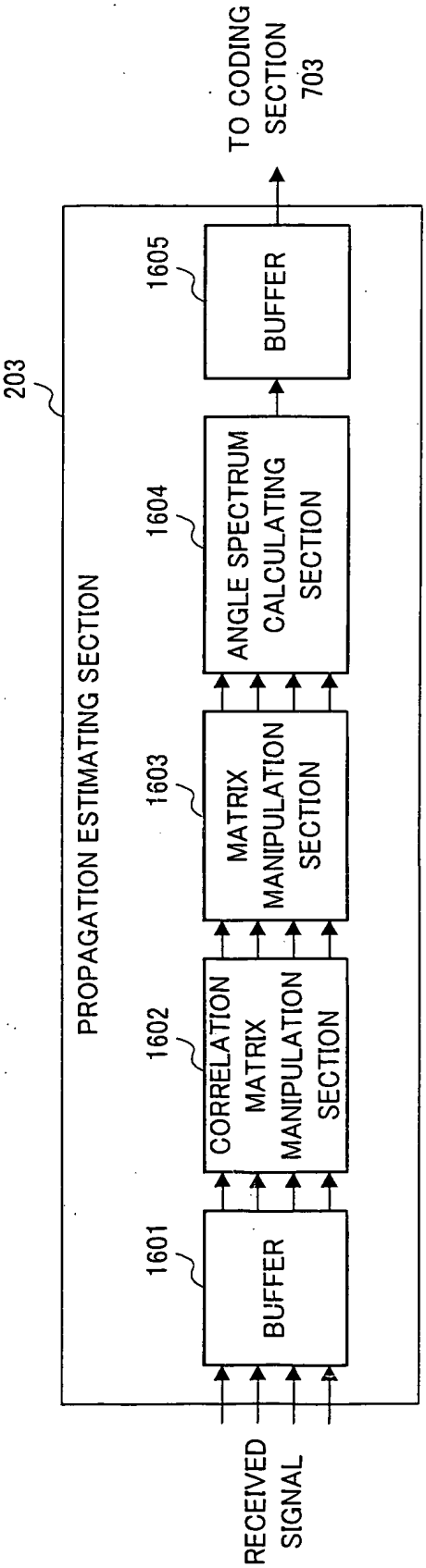

FIG.16

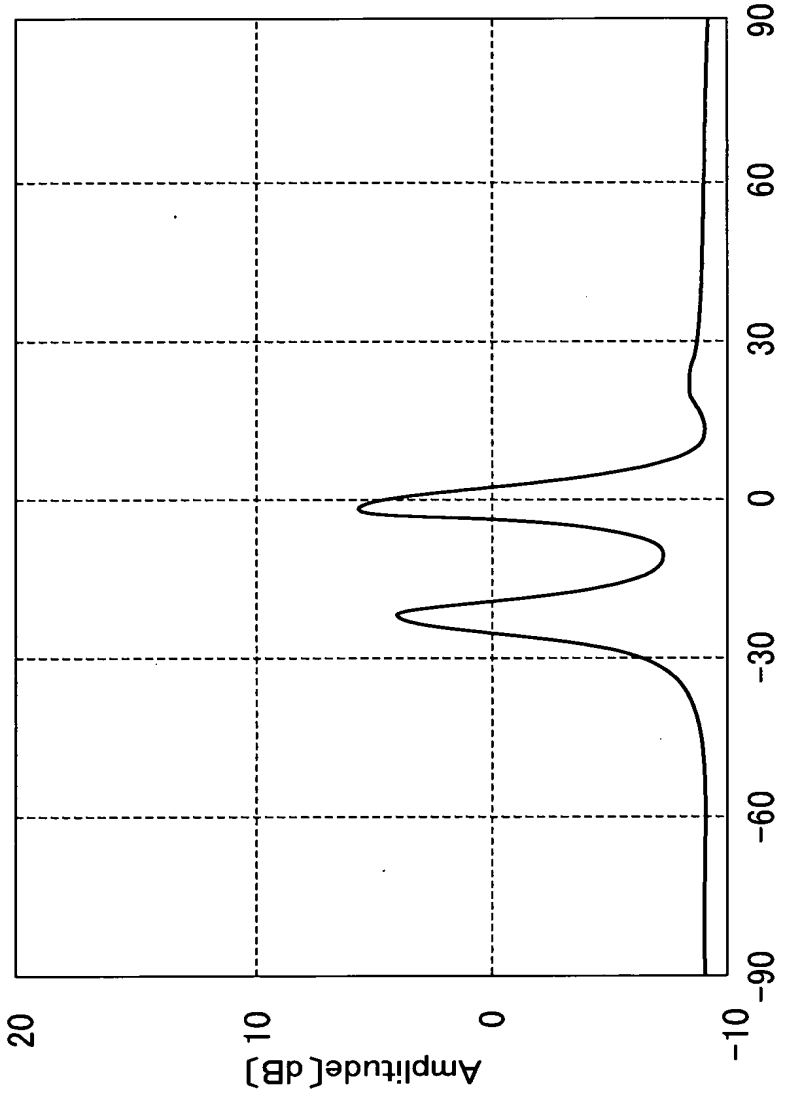
Amplitude[dB]
20
10
0
-10
-90
-60
-30
0
30
60
90
Azimuth Angle[°]
ESTIMATION OF THE
DIRECTION OF ARRIVAL

FIG.17

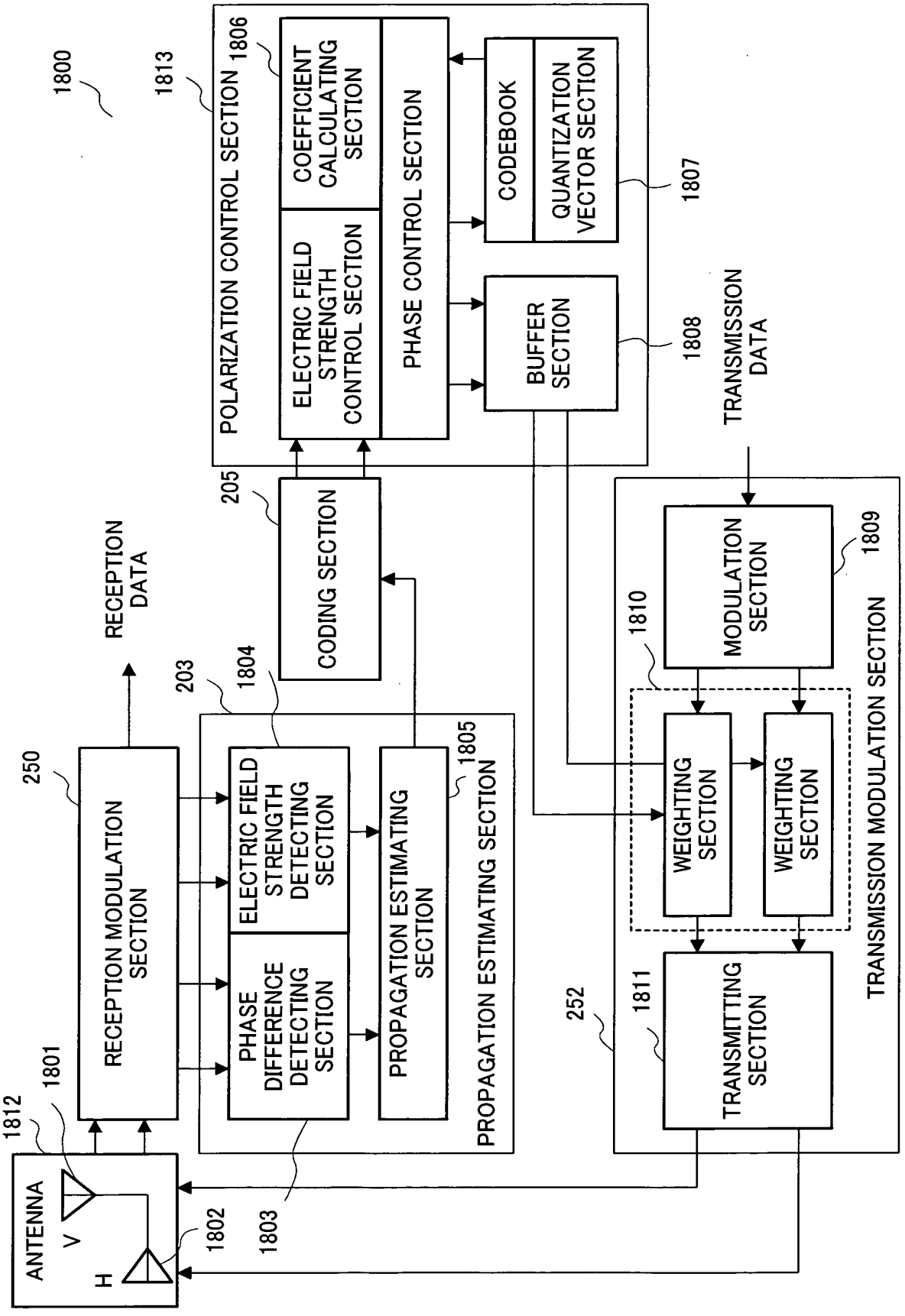
1800
1813
POLARIZATION CONTROL SECTION
1806
COEFFICIENT CALCULATING SECTION
ELECTRIC FIELD STRENGTH CONTROL SECTION
PHASE CONTROL SECTION
CODEBOOK
QUANTIZATION VECTOR SECTION
1807
BUFFER SECTION
1808
TRANSMISSION DATA
205
CODING SECTION
RECEPTION DATA
203
1804
250
RECEPTION MODULATION SECTION
ELECTRIC FIELD STRENGTH DETECTING SECTION
PHASE DIFFERENCE DETECTING SECTION
PROPAGATION ESTIMATING SECTION
1805
PROPAGATION ESTIMATING SECTION
1810
MODULATION SECTION
1809
WEIGHTING SECTION
WEIGHTING SECTION
252
1811
TRANSMITTING SECTION
TRANSMISSION MODULATION SECTION
1812
1801
ANTENNA
V
H
1802
1803

FIG.18

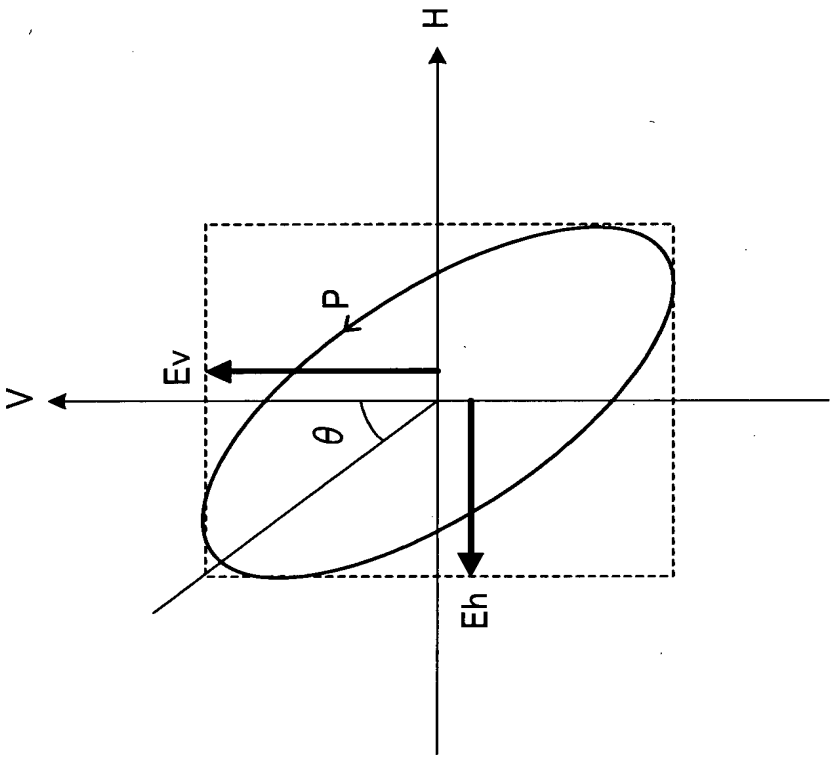

FIG.19

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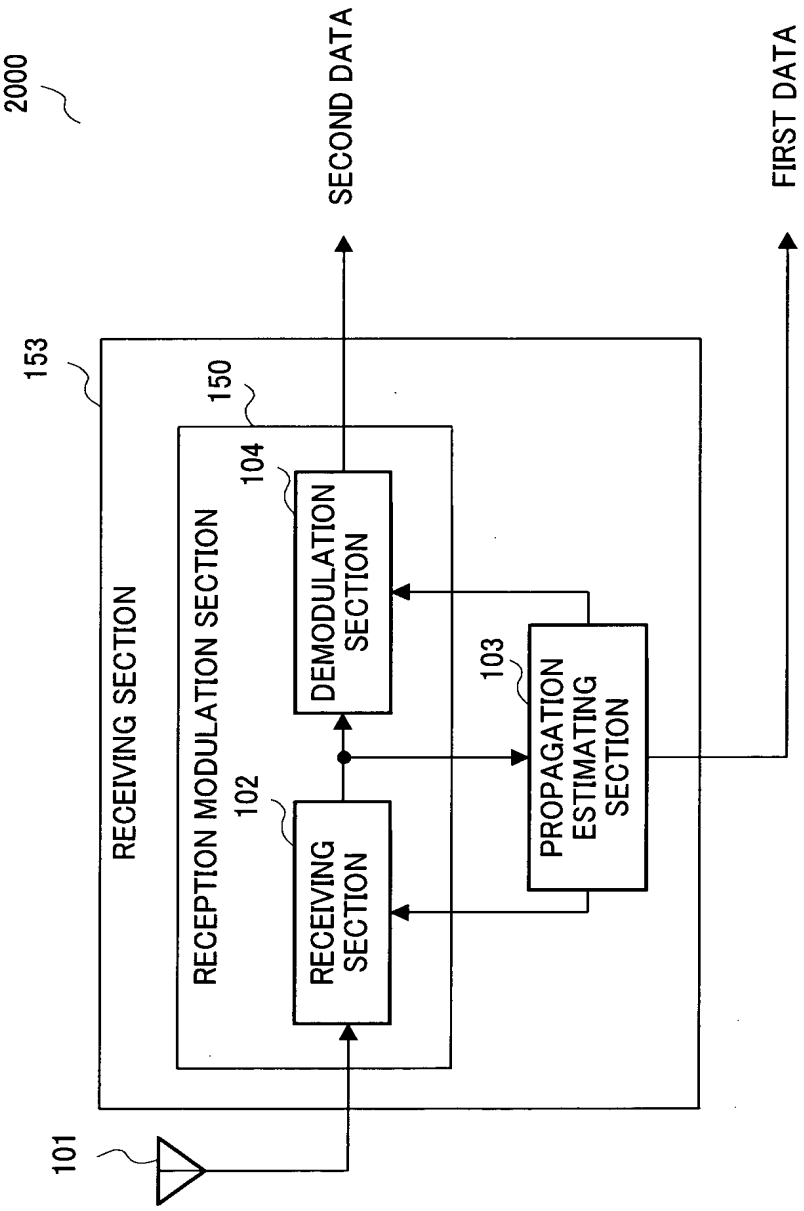

FIG.20

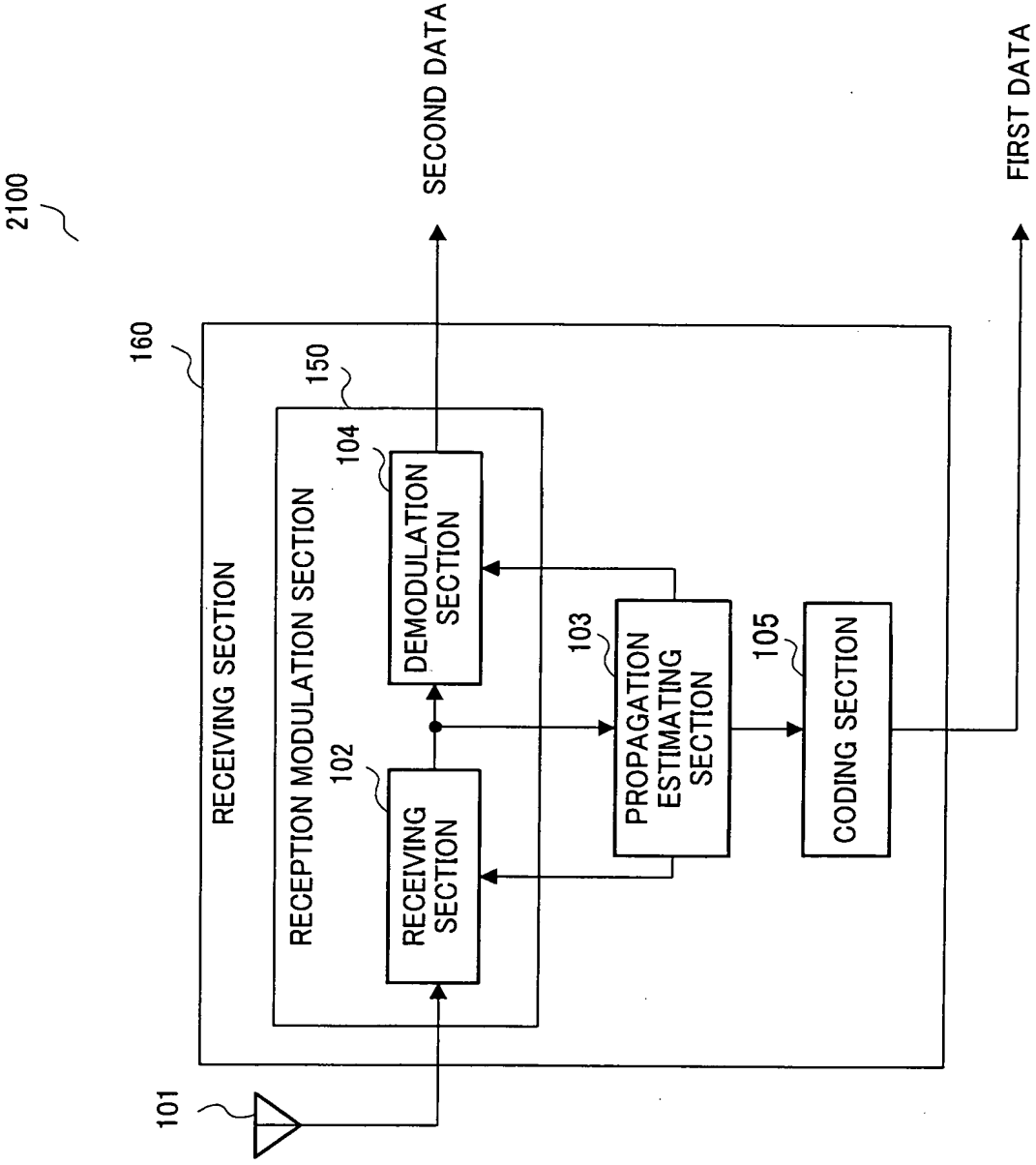
2100
SECOND DATA
FIRST DATA
160
150
104
DEMODULATION SECTION
RECEIVING SECTION
RECEPTION MODULATION SECTION
103
PROPAGATION ESTIMATING SECTION
105
CODING SECTION
102
RECEIVING SECTION
101

FIG.21

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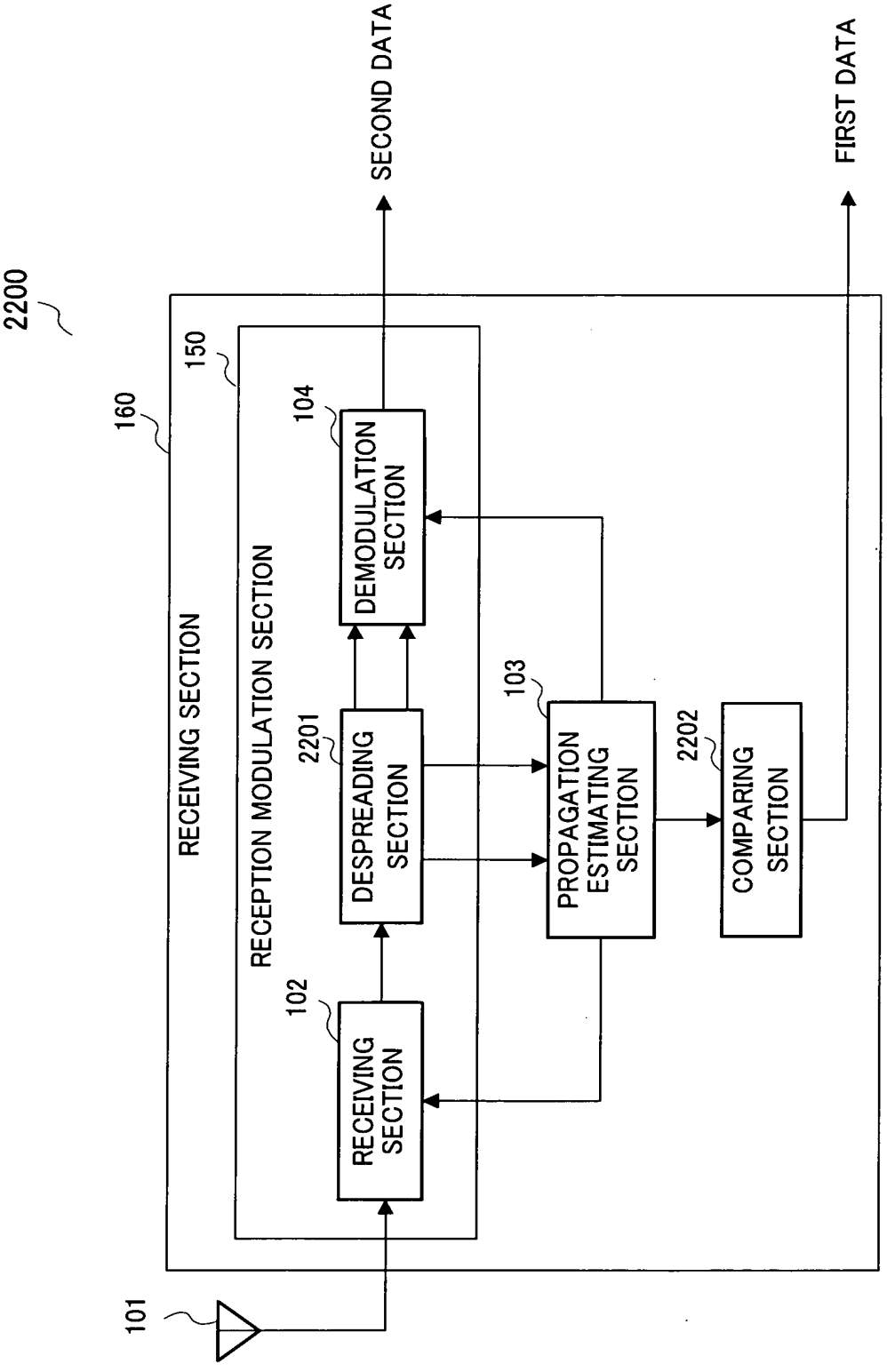

FIG.22

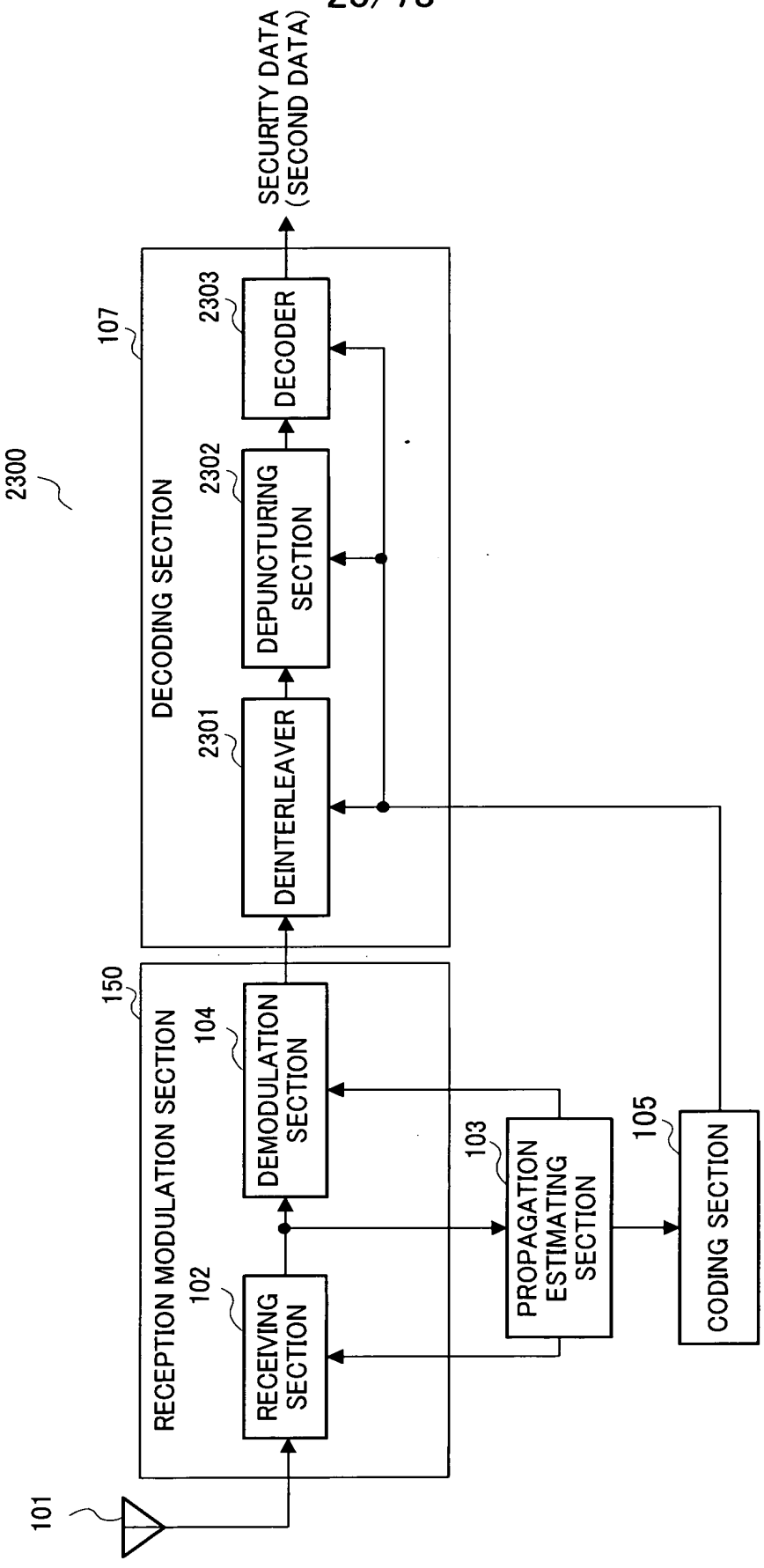
SECURITY DATA
(SECOND DATA)
2300
107
DECODING SECTION
2303
DECODER
2302
DEPUNCTURING
SECTION
2301
DEINTERLEAVER
150
RECEPTION MODULATION SECTION
104
DEMODULATION
SECTION
102
RECEIVING
SECTION
103
PROPAGATION
ESTIMATING
SECTION
105
CODING SECTION
101

FIG.23

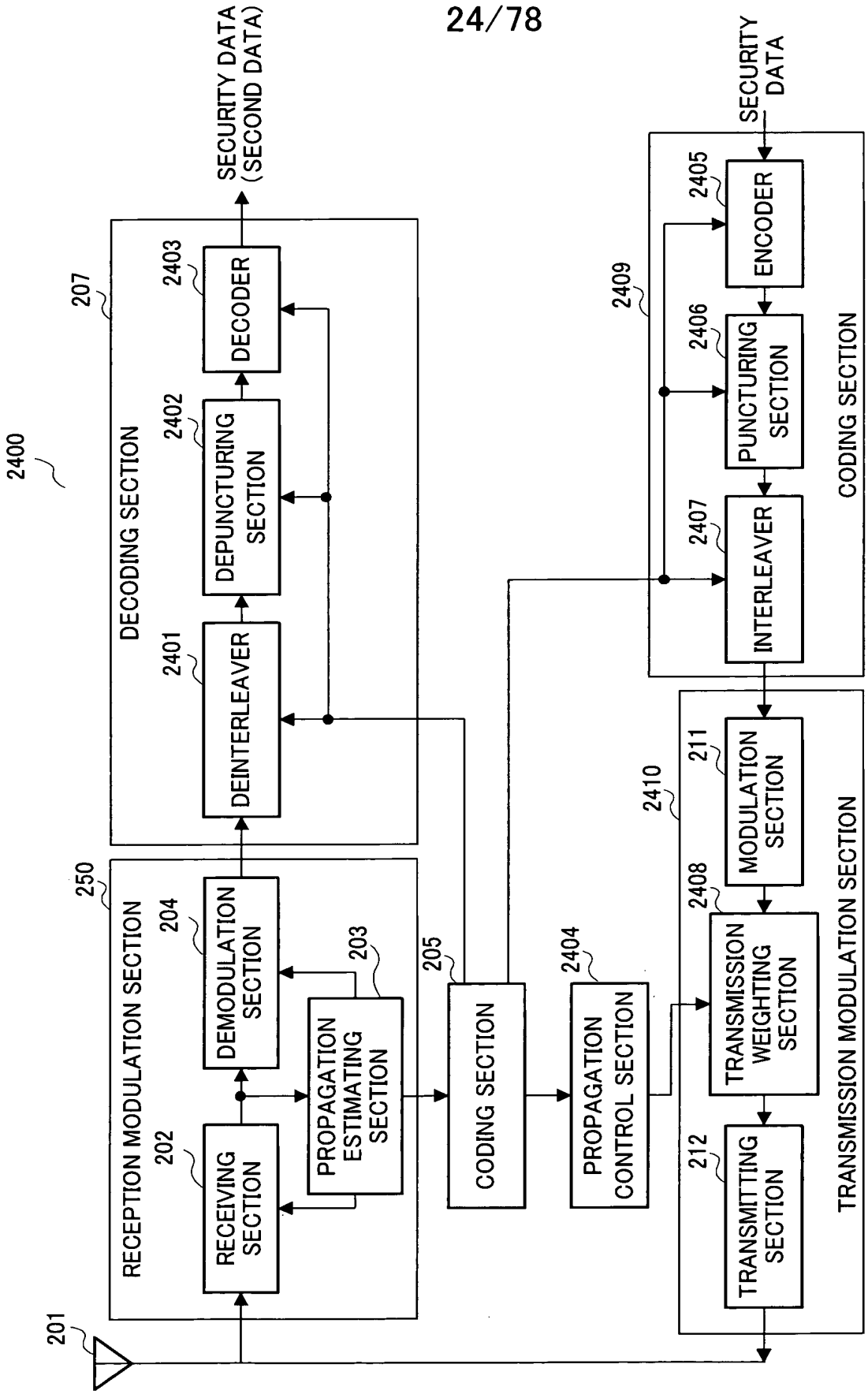
2400
201
250
RECEPTION MODULATION SECTION
202
RECEIVING SECTION
204
DEMODULATION SECTION
203
PROPAGATION ESTIMATING SECTION
205
CODING SECTION
2404
PROPAGATION CONTROL SECTION
207
DECODING SECTION
2401
DEINTERLEAVER
2402
DEPUNCTURING SECTION
2403
DECODER
SECURITY DATA (SECOND DATA)
2410
TRANSMISSION MODULATION SECTION
212
TRANSMITTING SECTION
2408
TRANSMISSION WEIGHTING SECTION
211
MODULATION SECTION
2409
CODING SECTION
2407
INTERLEAVER
2406
PUNCTURING SECTION
2405
ENCODER
SECURITY DATA

FIG.24

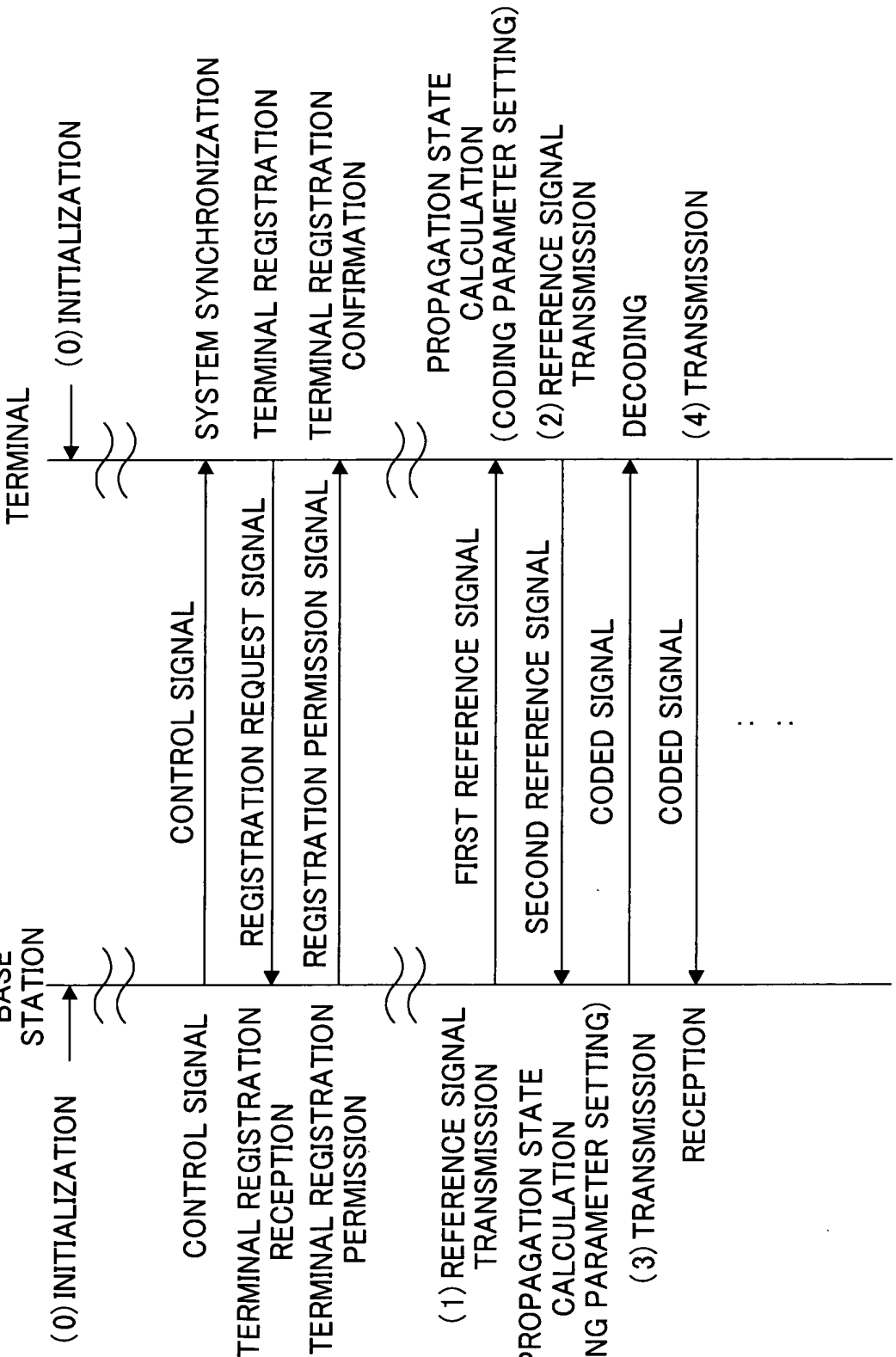
BASE STATION
TERMINAL
(0) INITIALIZATION
(0) INITIALIZATION
CONTROL SIGNAL
SYSTEM SYNCHRONIZATION
TERMINAL REGISTRATION RECEPTION
REGISTRATION REQUEST SIGNAL
TERMINAL REGISTRATION
TERMINAL REGISTRATION PERMISSION
REGISTRATION PERMISSION SIGNAL
TERMINAL REGISTRATION CONFIRMATION
(1) REFERENCE SIGNAL TRANSMISSION
FIRST REFERENCE SIGNAL
PROPAGATION STATE CALCULATION (CODING PARAMETER SETTING)
SECOND REFERENCE SIGNAL
PROPAGATION STATE CALCULATION (CODING PARAMETER SETTING)
(2) REFERENCE SIGNAL TRANSMISSION
(3) TRANSMISSION
CODED SIGNAL
DECODING
RECEPTION
CODED SIGNAL
(4) TRANSMISSION

FIG.25

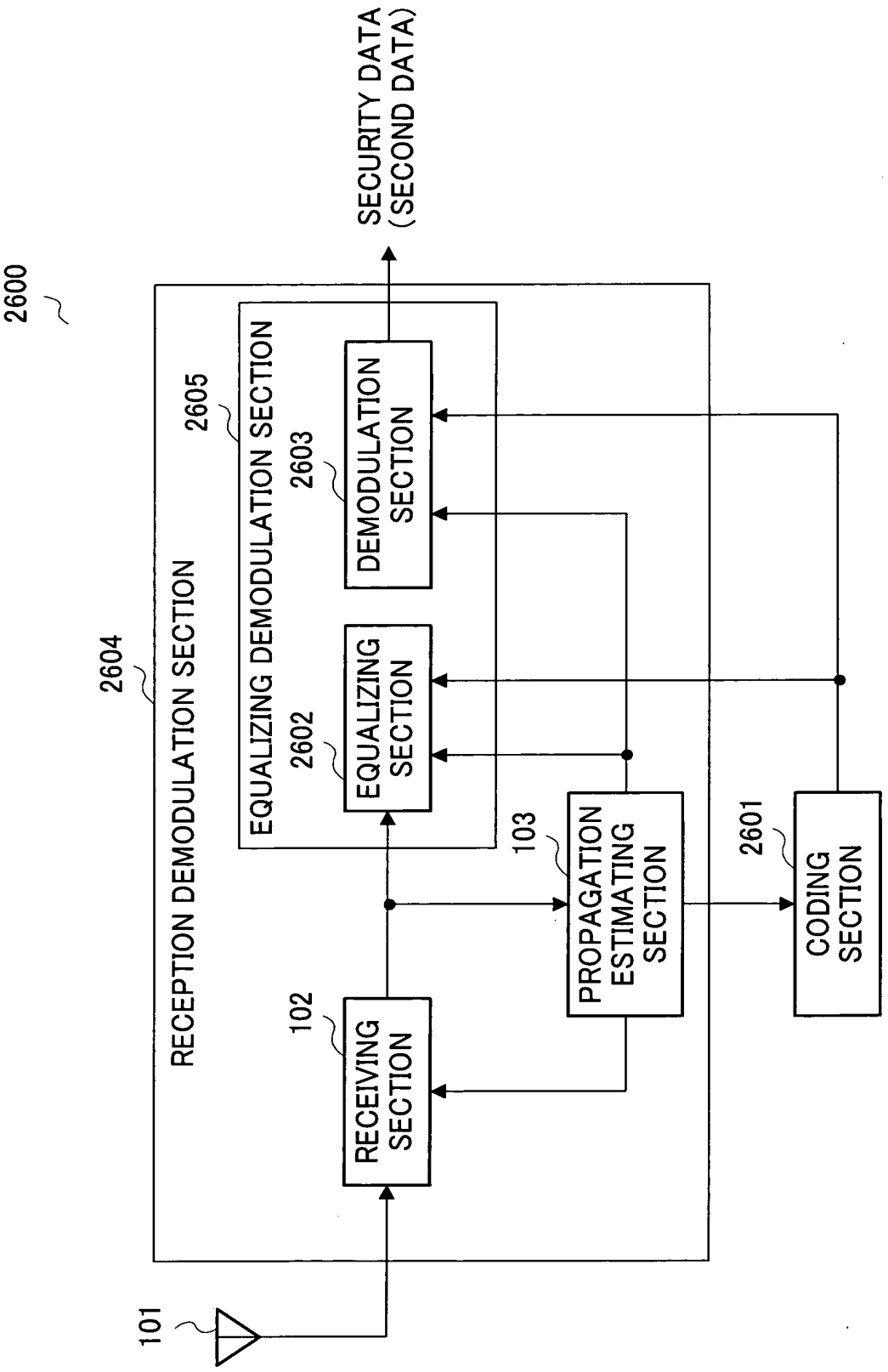
2600
SECURITY DATA
(SECOND DATA)
RECEPTION DEMODULATION SECTION
2604
EQUALIZING DEMODULATION SECTION
2605
DEMODULATION SECTION
2603
EQUALIZING SECTION
2602
RECEIVING SECTION
102
PROPAGATION ESTIMATING SECTION
103
CODING SECTION
2601
101

FIG.26

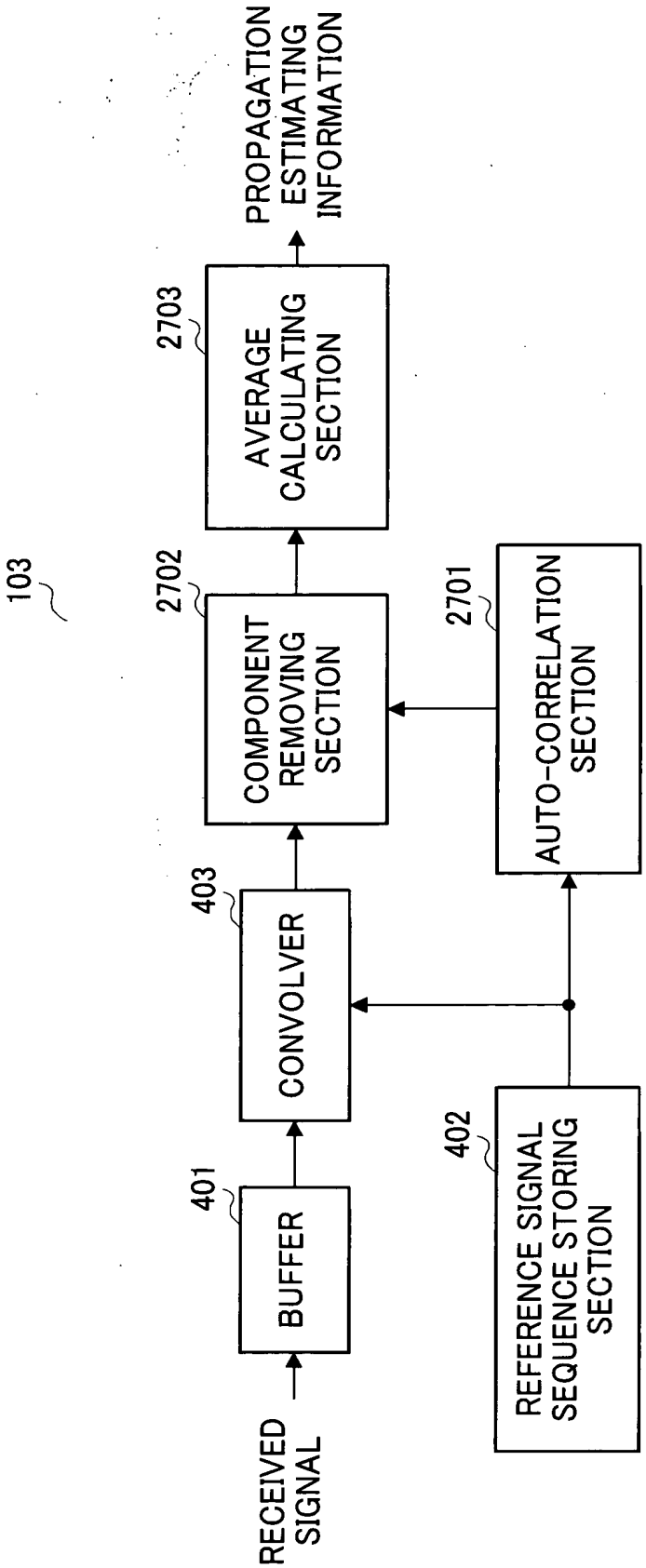
103
RECEIVED SIGNAL
401
BUFFER
403
CONVOLVER
402
REFERENCE SIGNAL SEQUENCE STORING SECTION
2702
COMPONENT REMOVING SECTION
2701
AUTO-CORRELATION SECTION
2703
AVERAGE CALCULATING SECTION
PROPAGATION ESTIMATING INFORMATION

FIG.27

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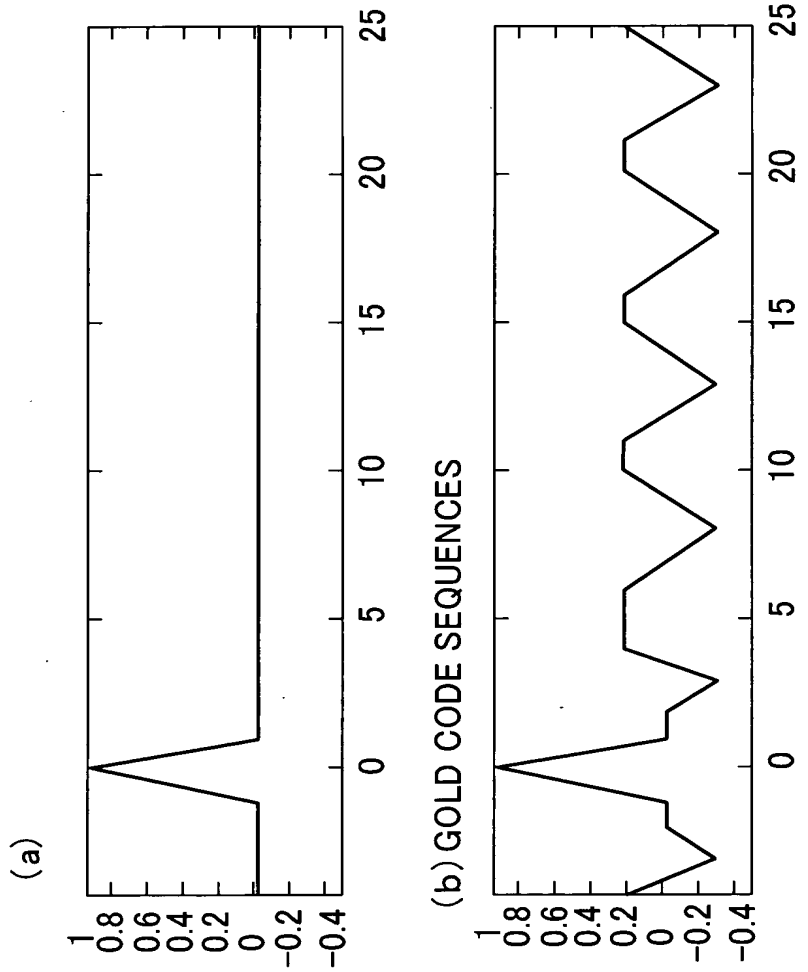

FIG.28

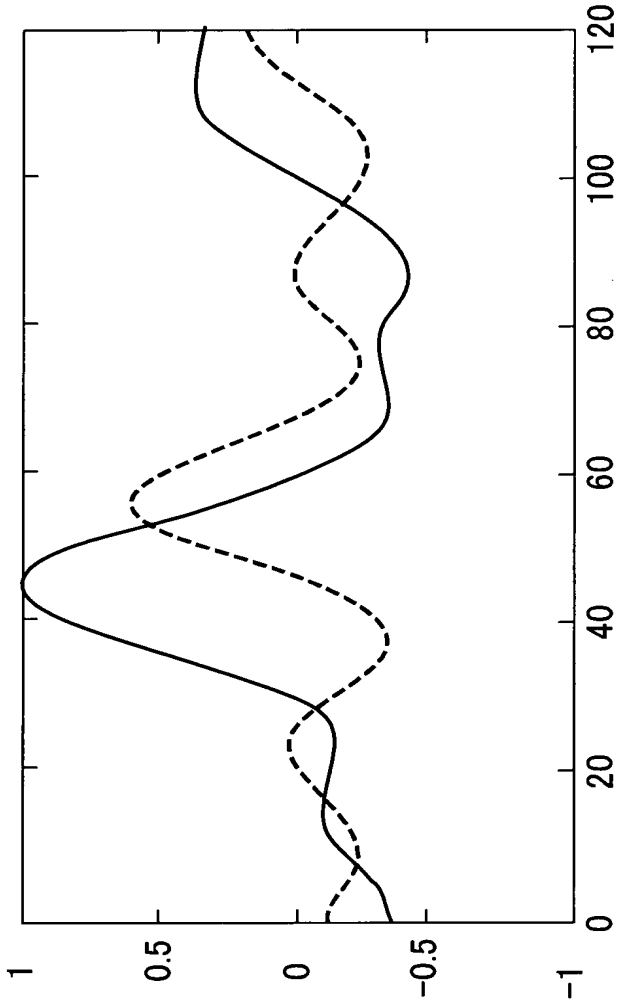

FIG.29

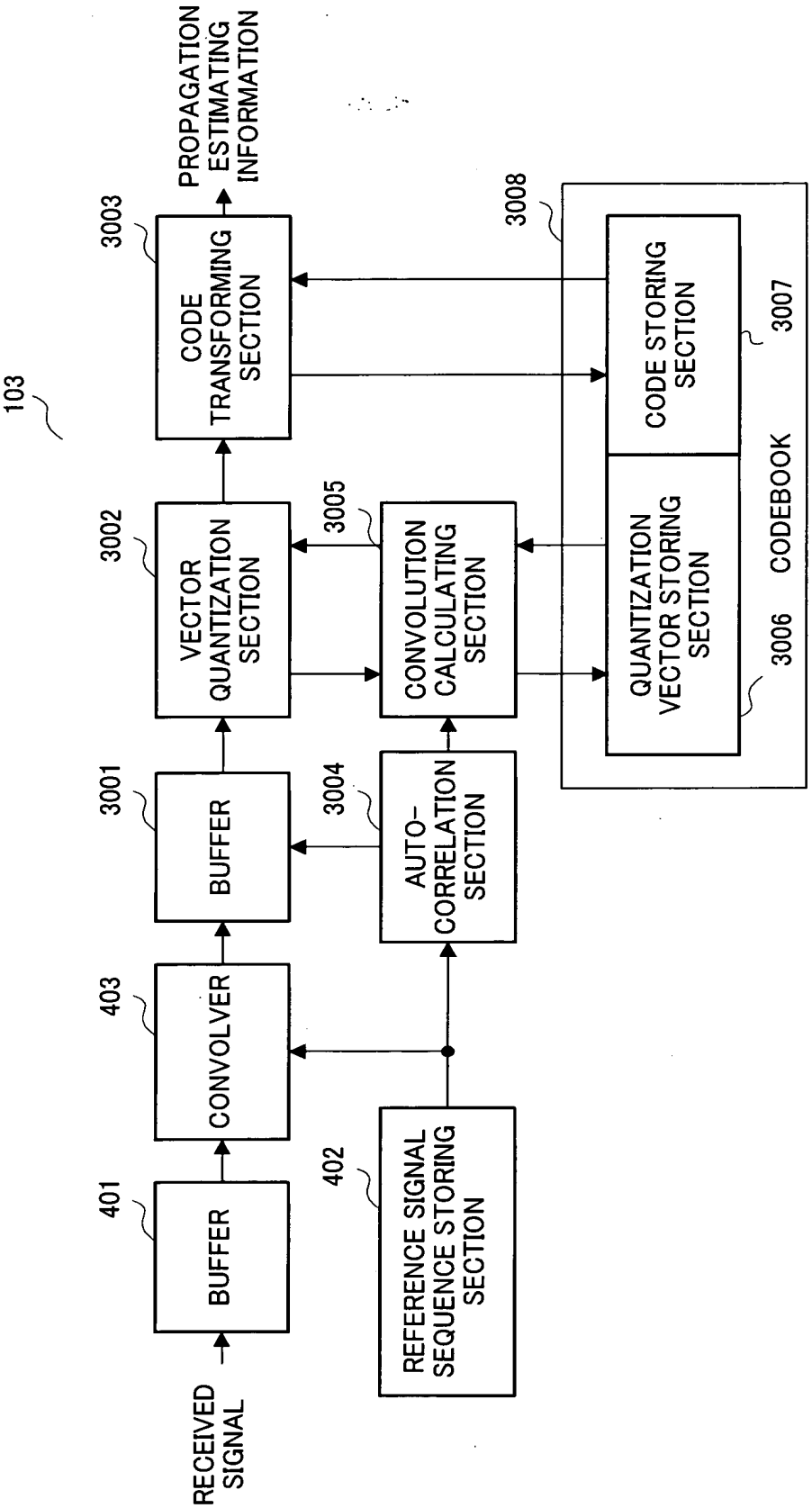
RECEIVED SIGNAL
401
BUFFER
403
CONVOLVER
3001
BUFFER
3002
VECTOR QUANTIZATION SECTION
3003
CODE TRANSFORMING SECTION
PROPAGATION ESTIMATING INFORMATION
103
402
REFERENCE SIGNAL SEQUENCE STORING SECTION
3004
AUTO-CORRELATION SECTION
3005
CONVOLUTION CALCULATING SECTION
3008
CODEBOOK
3006
QUANTIZATION VECTOR STORING SECTION
3007
CODE STORING SECTION

FIG.30

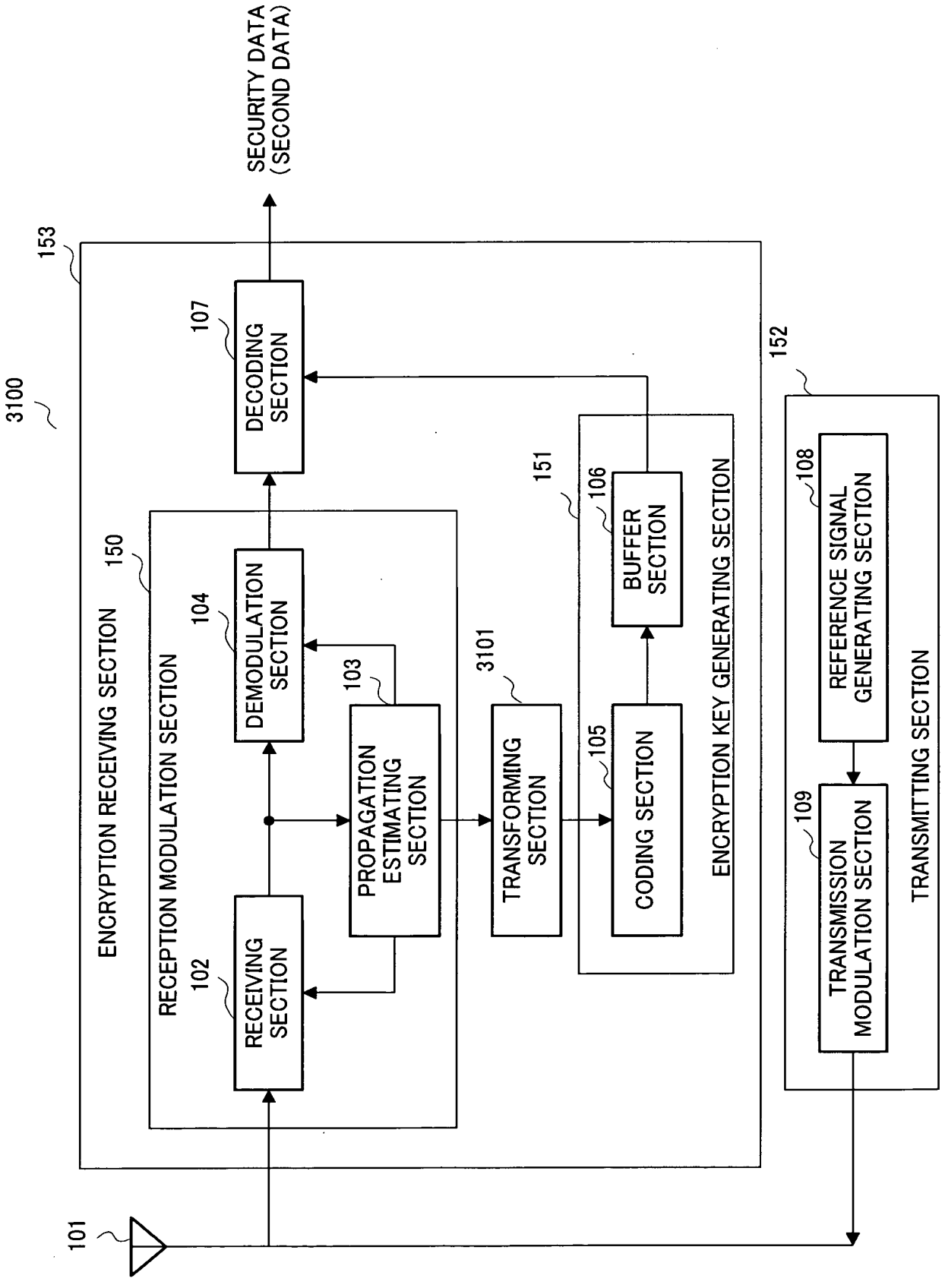
SECURITY DATA
(SECOND DATA)
153
3100
107
DECODING SECTION
152
ENCRYPTION RECEIVING SECTION
150
RECEPTION MODULATION SECTION
104
DEMODULATION SECTION
151
106
BUFFER SECTION
108
REFERENCE SIGNAL GENERATING SECTION
103
3101
ENCRYPTION KEY GENERATING SECTION
PROPAGATION ESTIMATING SECTION
TRANSFORMING SECTION
105
CODING SECTION
102
RECEIVING SECTION
109
TRANSMISSION MODULATION SECTION
TRANSMITTING SECTION
101

FIG.31

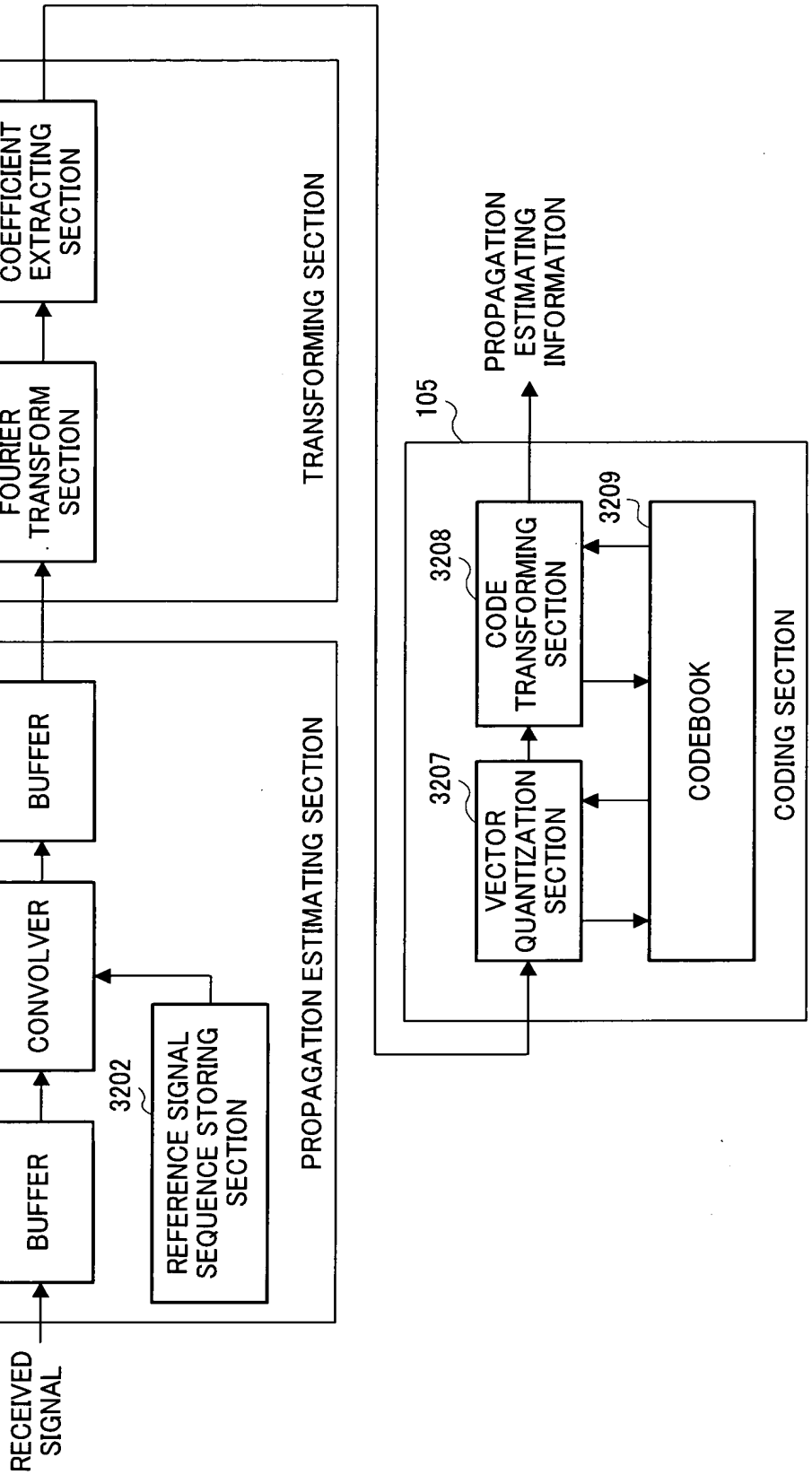
RECEIVED SIGNAL
103
PROPAGATION ESTIMATING SECTION
3201
BUFFER
3202
REFERENCE SIGNAL SEQUENCE STORING SECTION
3203
CONVOLVER
3204
BUFFER
3101
TRANSFORMING SECTION
3205
FOURIER TRANSFORM SECTION
3206
COEFFICIENT EXTRACTING SECTION
105
CODING SECTION
3207
VECTOR QUANTIZATION SECTION
3208
CODE TRANSFORMING SECTION
3209
CODEBOOK
PROPAGATION ESTIMATING INFORMATION

FIG.32

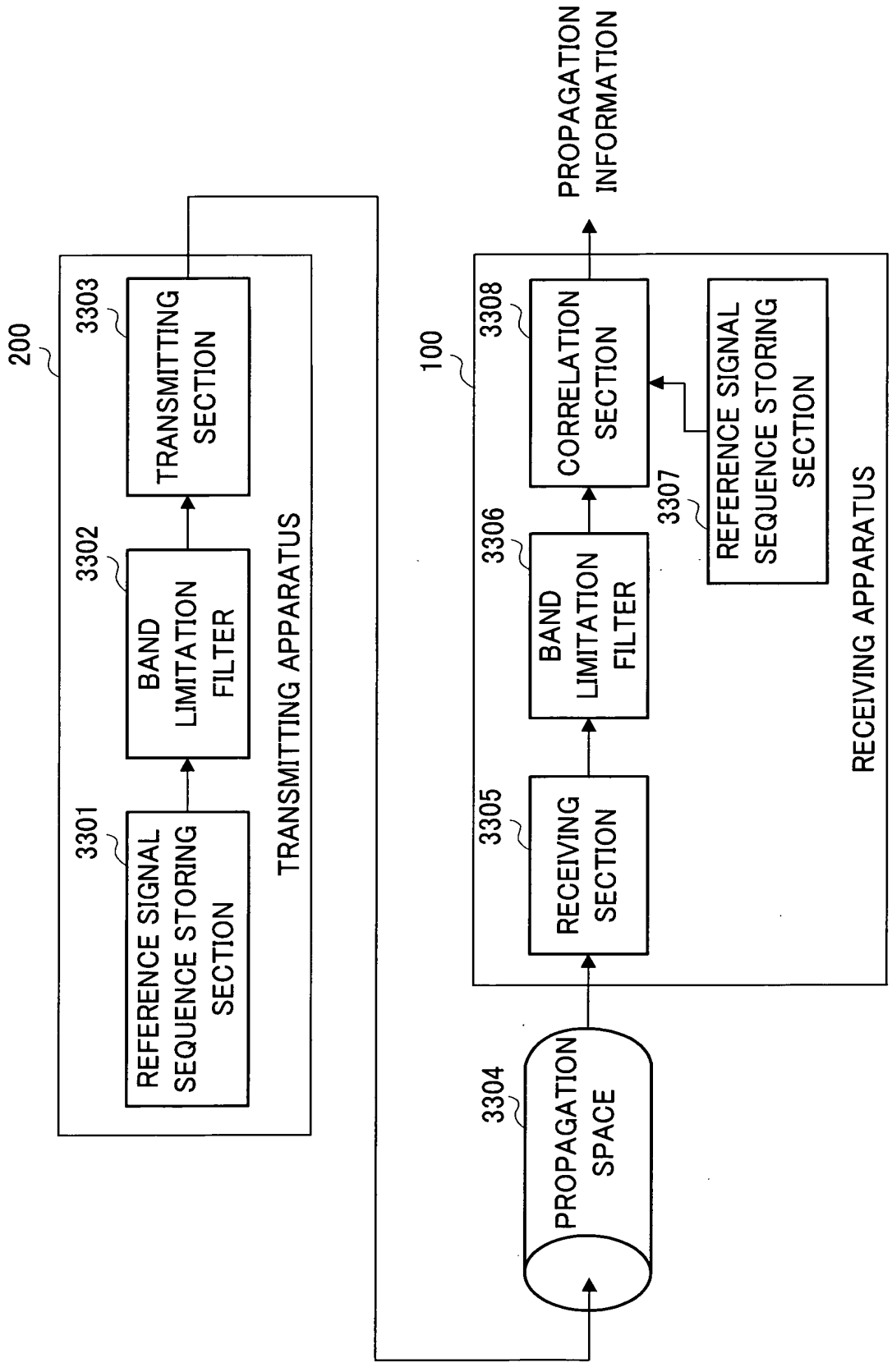
200
3303
TRANSMITTING SECTION
3302
BAND LIMITATION FILTER
3301
REFERENCE SIGNAL SEQUENCE STORING SECTION
TRANSMITTING APPARATUS
PROPAGATION INFORMATION
100
3308
CORRELATION SECTION
3306
BAND LIMITATION FILTER
3307
REFERENCE SIGNAL SEQUENCE STORING SECTION
3305
RECEIVING SECTION
RECEIVING APPARATUS
3304
PROPAGATION SPACE

FIG.33

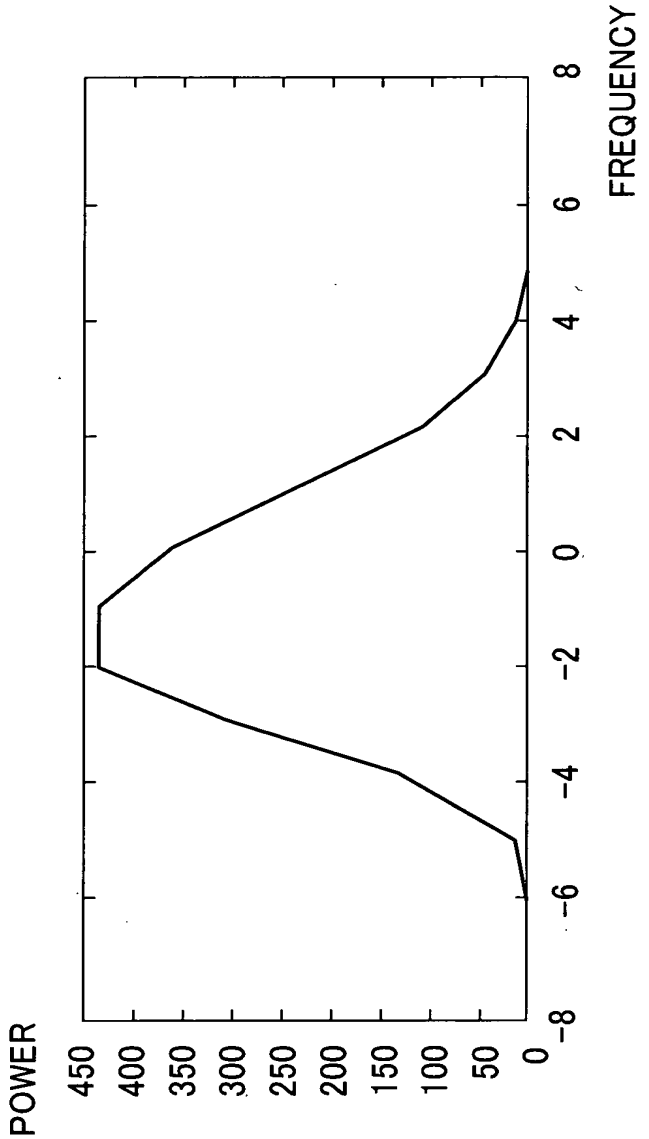
POWER
450
400
350
300
250
200
150
100
50
0
-8
-6
-4
-2
0
2
4
6
8
FREQUENCY

FIG.34

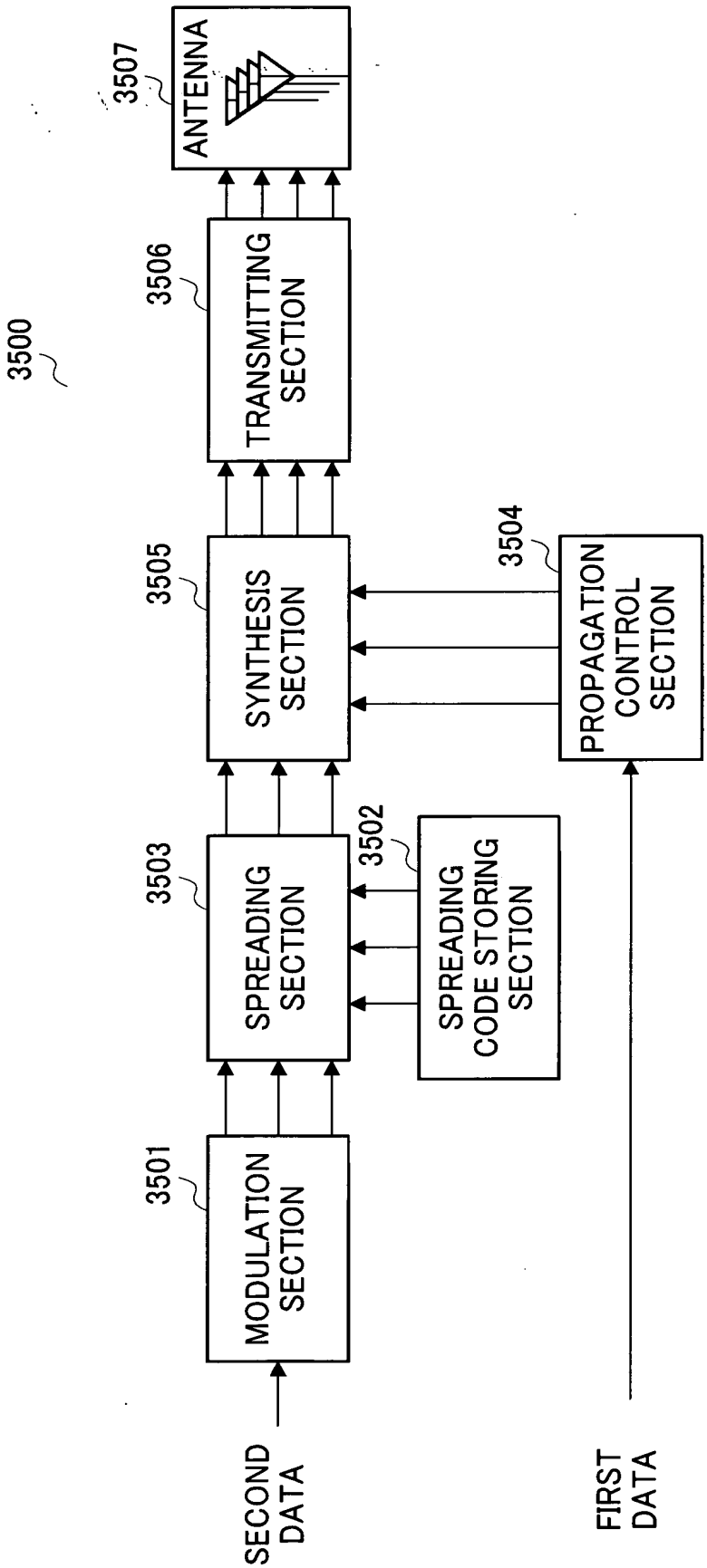
3500
3501
MODULATION SECTION
3502
SPREADING CODE STORING SECTION
3503
SPREADING SECTION
3504
PROPAGATION CONTROL SECTION
3505
SYNTHESIS SECTION
3506
TRANSMITTING SECTION
3507
ANTENNA
SECOND DATA
FIRST DATA

FIG.35

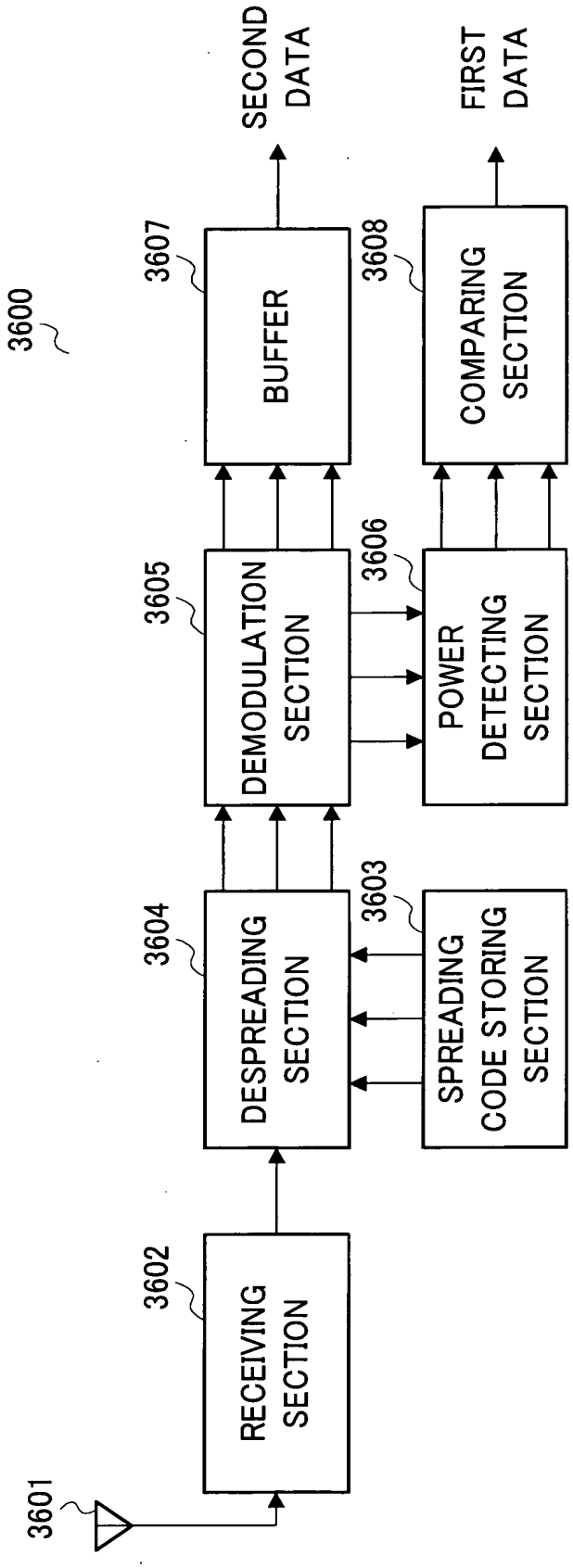
3600
3601
3602
RECEIVING SECTION
3603
SPREADING CODE STORING SECTION
3604
DESPREADING SECTION
3605
DEMODULATION SECTION
3606
POWER DETECTING SECTION
3607
BUFFER
3608
COMPARING SECTION
SECOND DATA
FIRST DATA

FIG.36

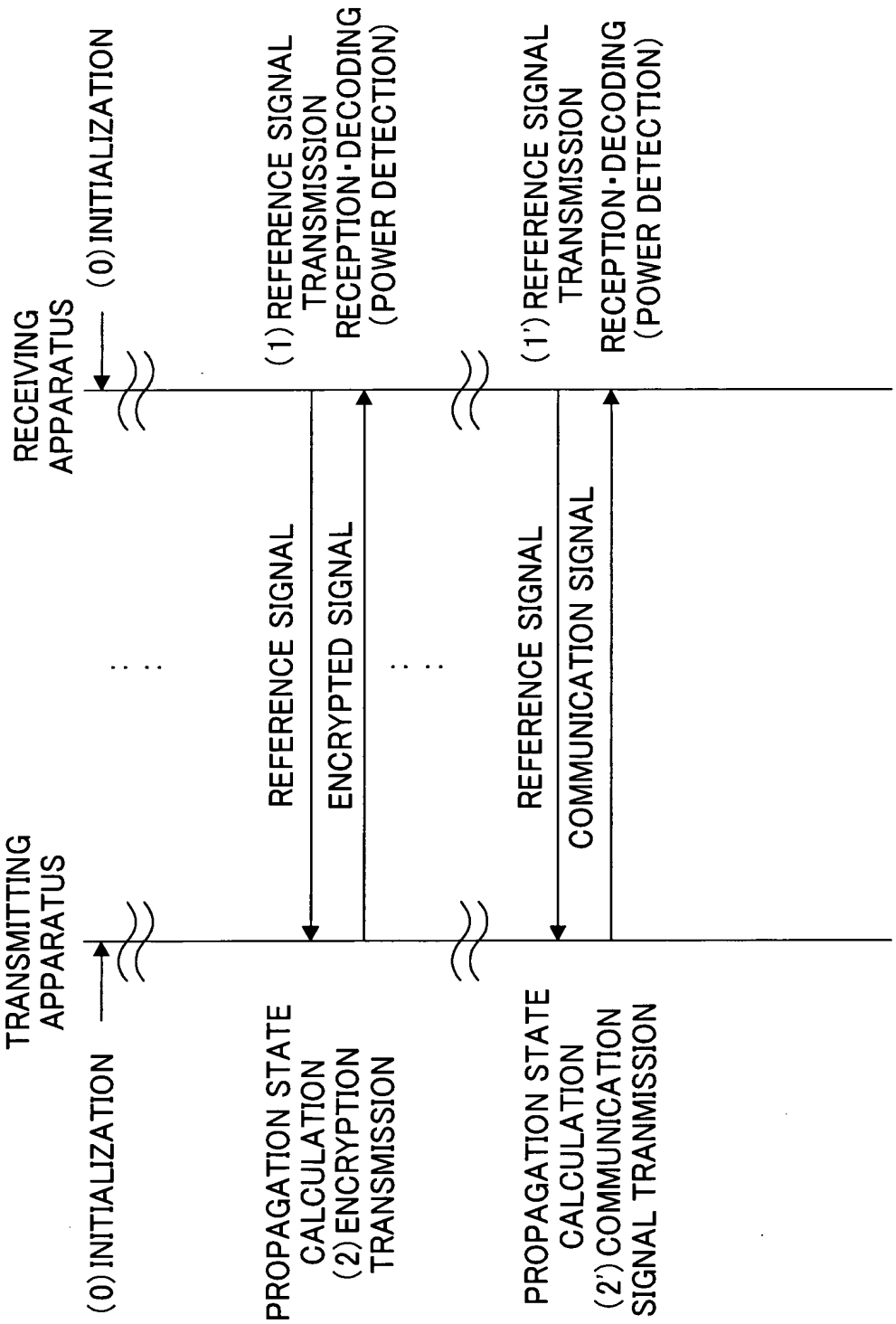
RECEIVING APPARATUS
(0) INITIALIZATION
(1) REFERENCE SIGNAL TRANSMISSION
RECEPTION·DECODING (POWER DETECTION)
(1') REFERENCE SIGNAL TRANSMISSION
RECEPTION·DECODING (POWER DETECTION)
REFERENCE SIGNAL
ENCRYPTED SIGNAL
REFERENCE SIGNAL
COMMUNICATION SIGNAL
TRANSMITTING APPARATUS
(0) INITIALIZATION
PROPAGATION STATE CALCULATION
(2) ENCRYPTION TRANSMISSION
PROPAGATION STATE CALCULATION
(2') COMMUNICATION SIGNAL TRANMISSION

FIG.37

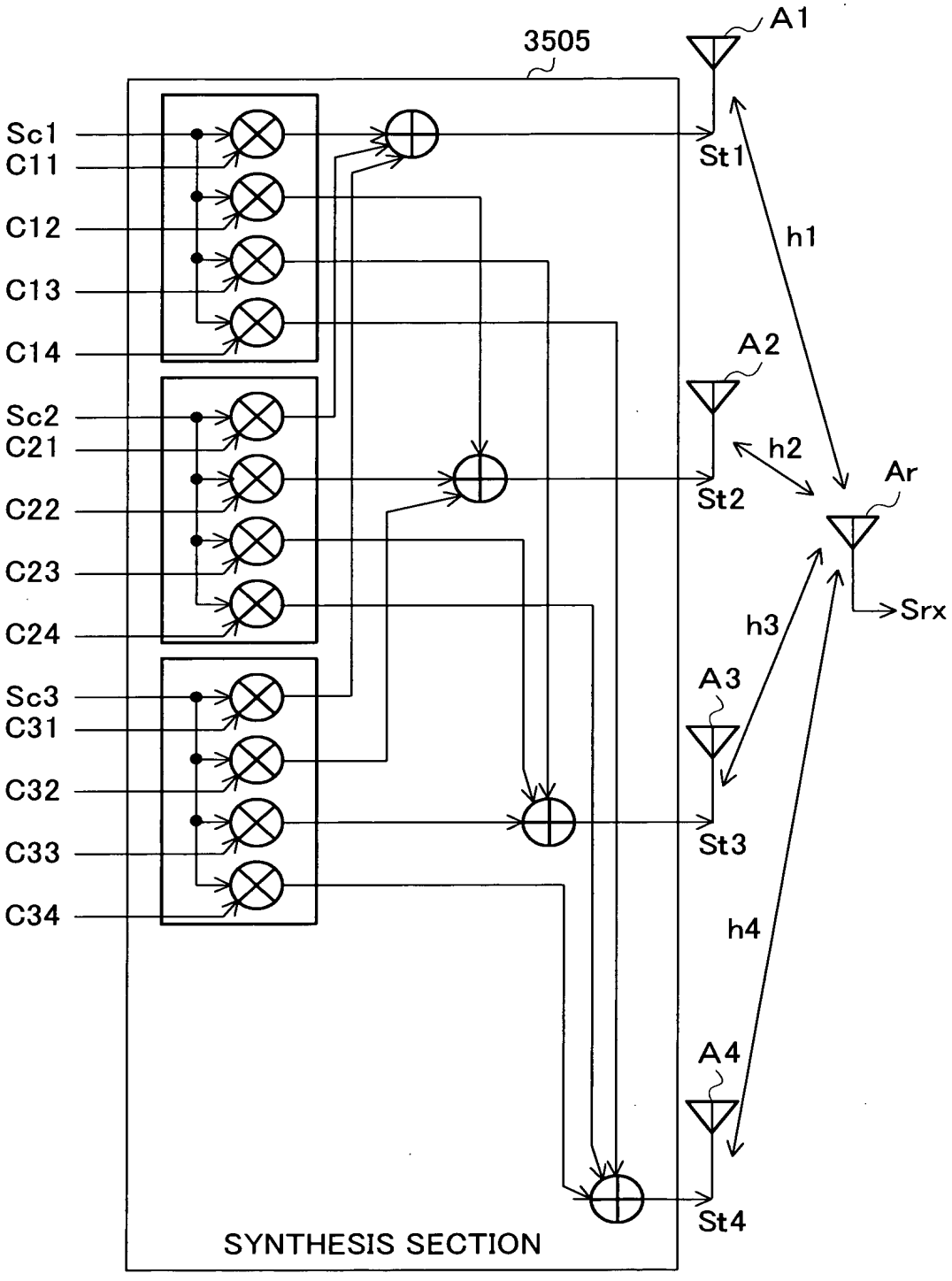
3505
A1
Sc1
C11
C12
C13
C14
St1
h1
A2
Sc2
C21
C22
C23
C24
h2
St2
Ar
Srx
h3
A3
Sc3
C31
C32
C33
C34
St3
h4
A4
St4
SYNTHESIS SECTION

FIG.38

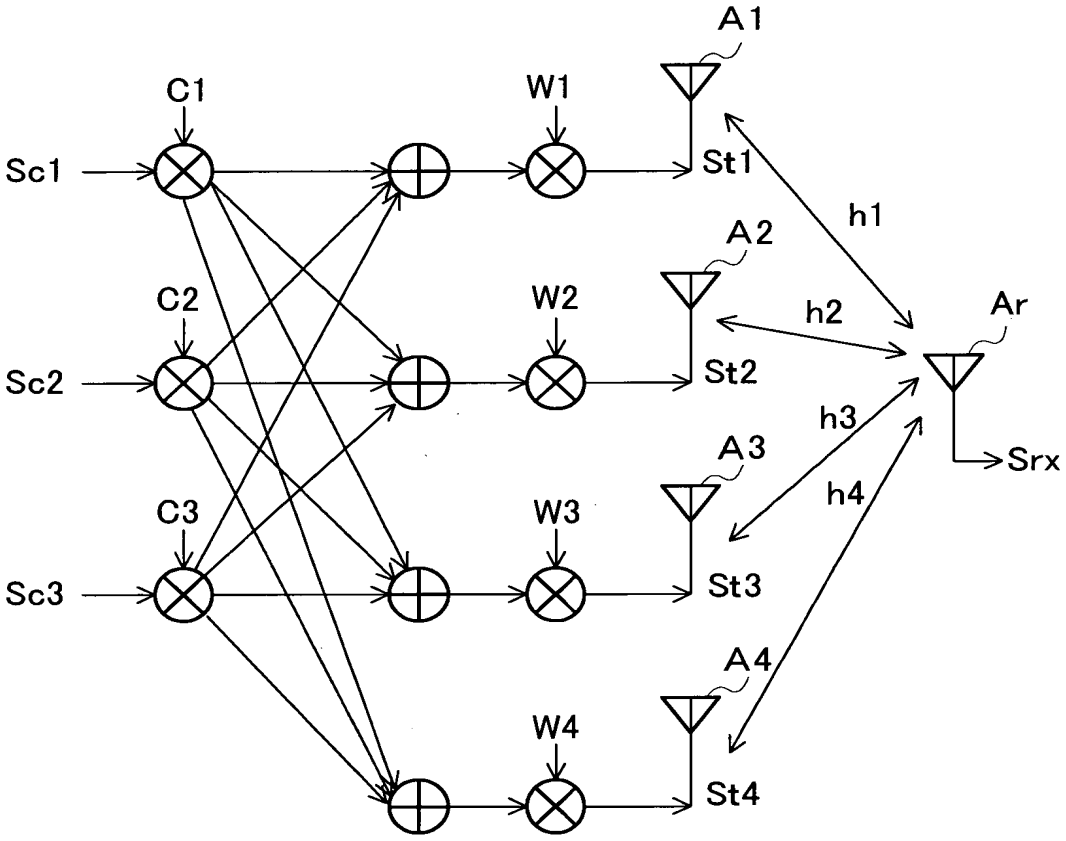
A1
C1
W1
Sc1
St1
h1
A2
C2
W2
h2
Ar
Sc2
St2
h3
A3
Srx
C3
W3
h4
Sc3
St3
A4
W4
St4

FIG.39

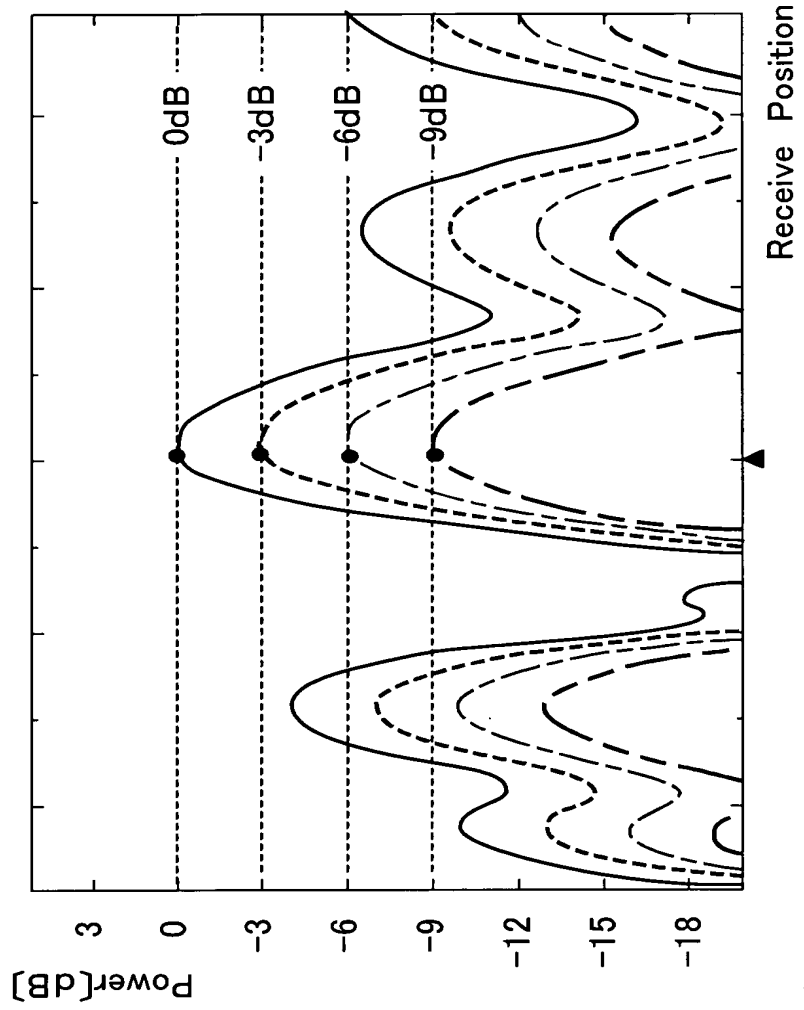

FIG.40

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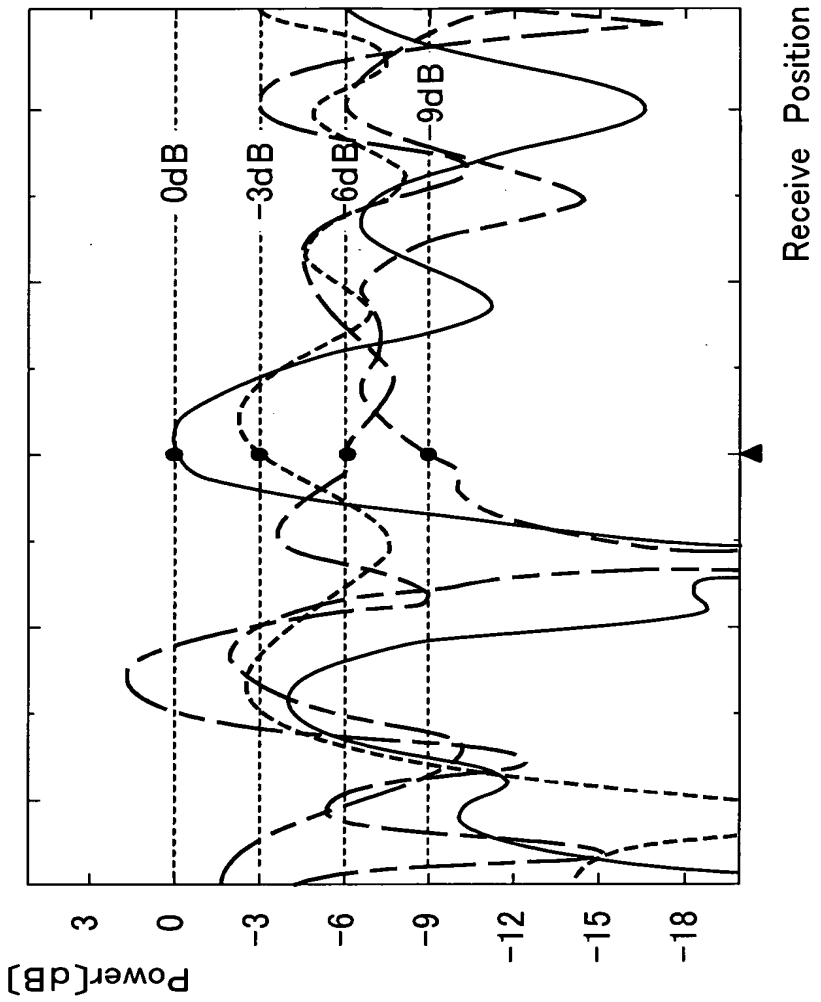

FIG.41

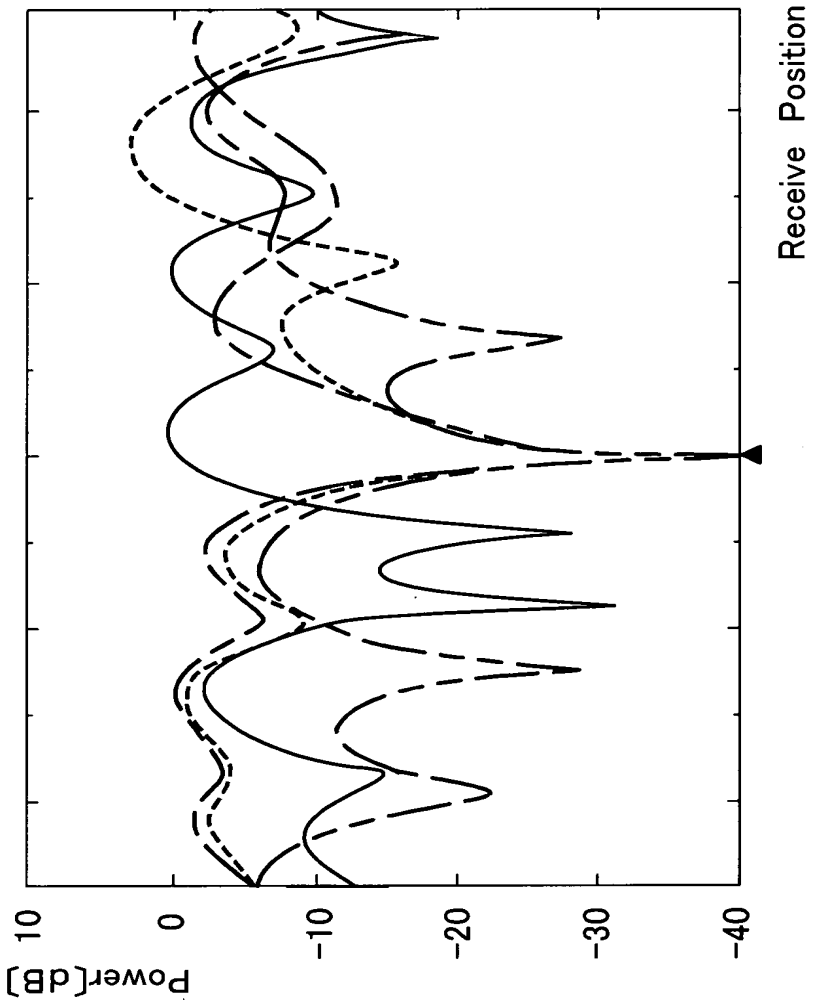

FIG.42

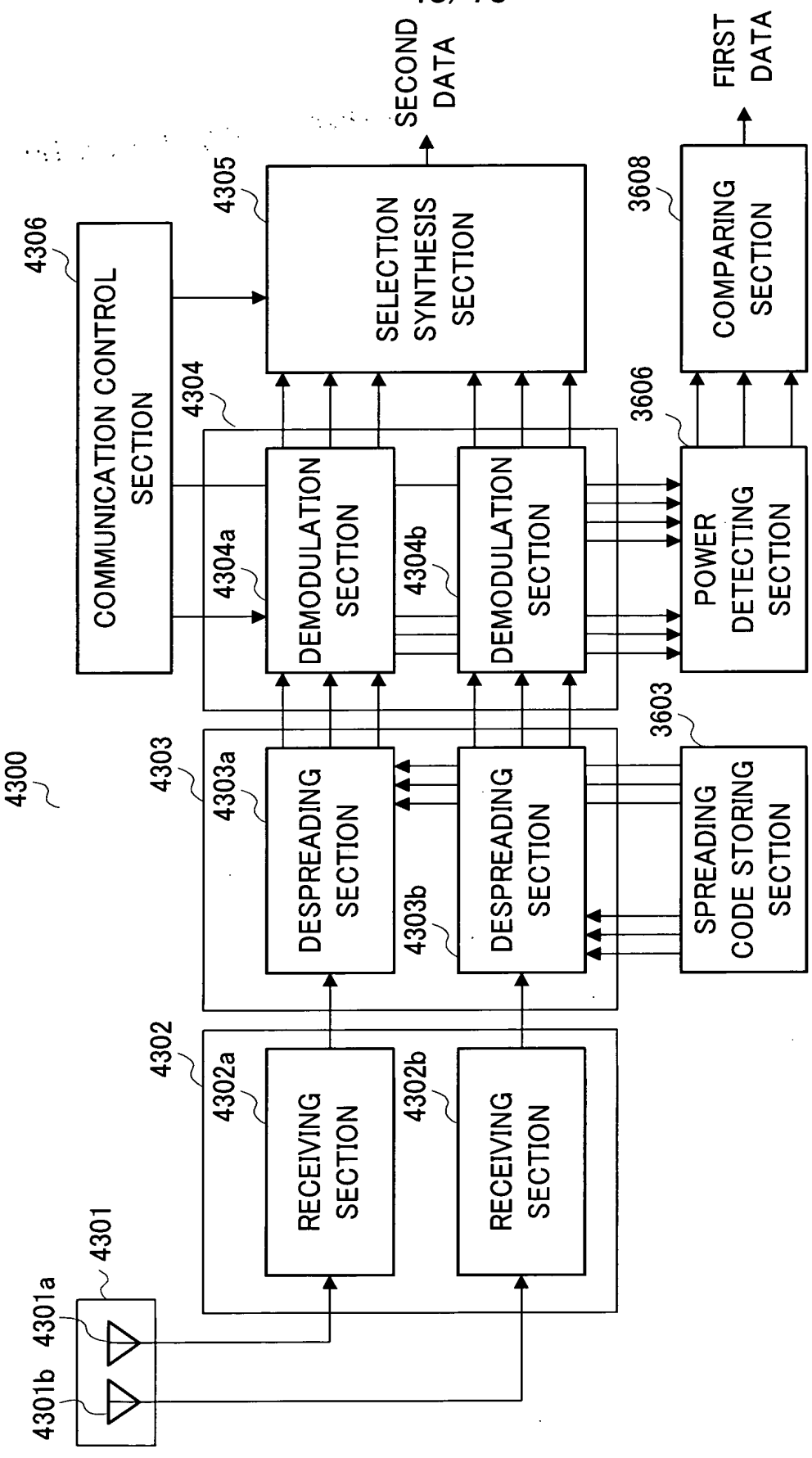
4300
4301
4301a
4301b
4302
4302a
4302b
RECEIVING SECTION
RECEIVING SECTION
4303
4303a
4303b
DESPREADING SECTION
DESPREADING SECTION
4304
4304a
4304b
DEMODULATION SECTION
DEMODULATION SECTION
4305
SELECTION SYNTHESIS SECTION
SECOND DATA
4306
COMMUNICATION CONTROL SECTION
3603
SPREADING CODE STORING SECTION
3606
POWER DETECTING SECTION
3608
COMPARING SECTION
FIRST DATA

FIG.43

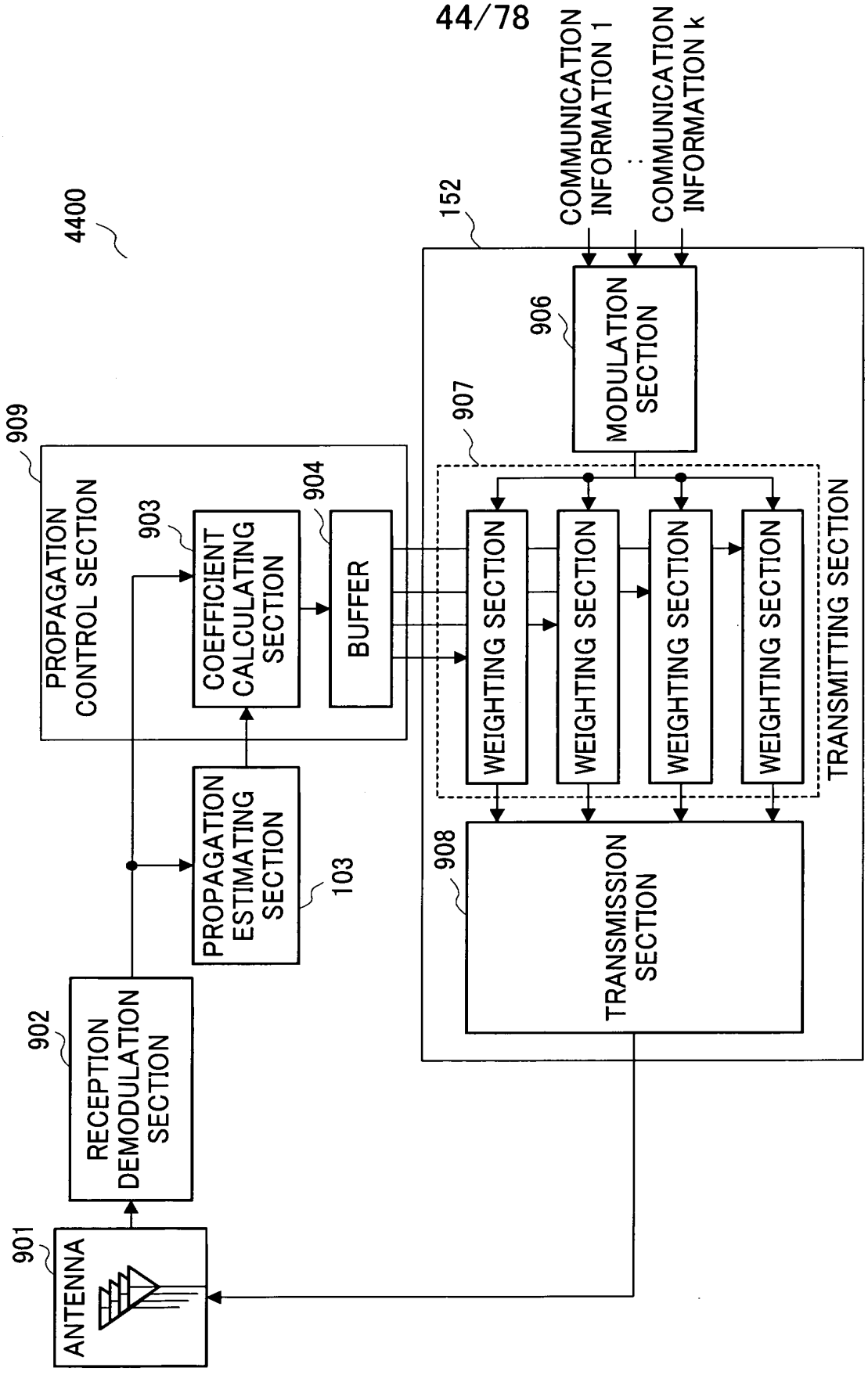
4400
152
COMMUNICATION INFORMATION 1
COMMUNICATION INFORMATION k
906
MODULATION SECTION
907
WEIGHTING SECTION
WEIGHTING SECTION
WEIGHTING SECTION
WEIGHTING SECTION
TRANSMITTING SECTION
908
TRANSMISSION SECTION
909
PROPAGATION CONTROL SECTION
903
COEFFICIENT CALCULATING SECTION
904
BUFFER
PROPAGATION ESTIMATING SECTION
103
902
RECEPTION DEMODULATION SECTION
901
ANTENNA

FIG.44

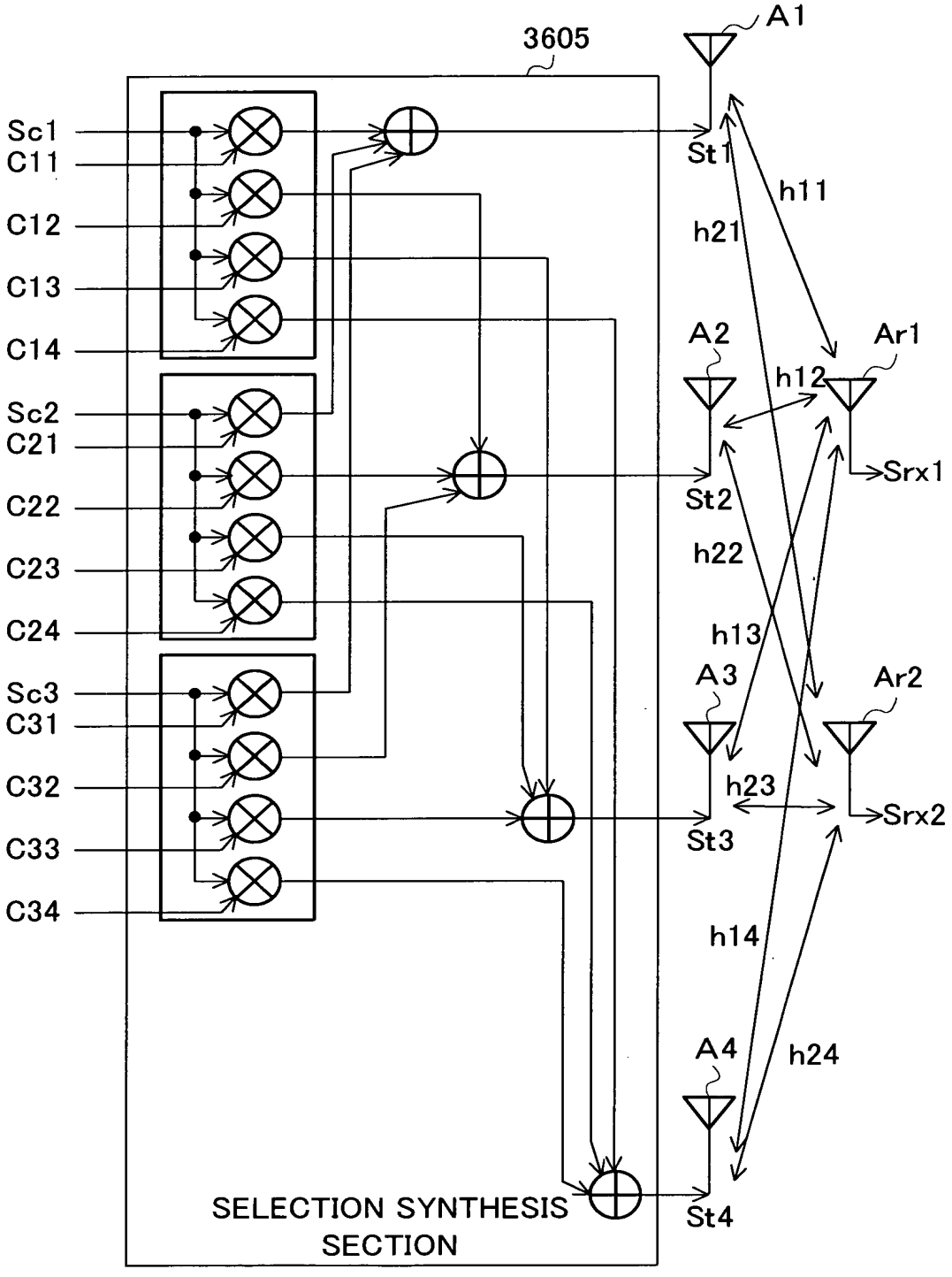
3605
A1
Sc1
C11
C12
C13
C14
Sc2
C21
C22
C23
C24
Sc3
C31
C32
C33
C34
St1
h11
h21
A2
Ar1
h12
Srx1
St2
h22
h13
A3
Ar2
h23
Srx2
St3
h14
A4
h24
St4
SELECTION SYNTHESIS SECTION

FIG.45

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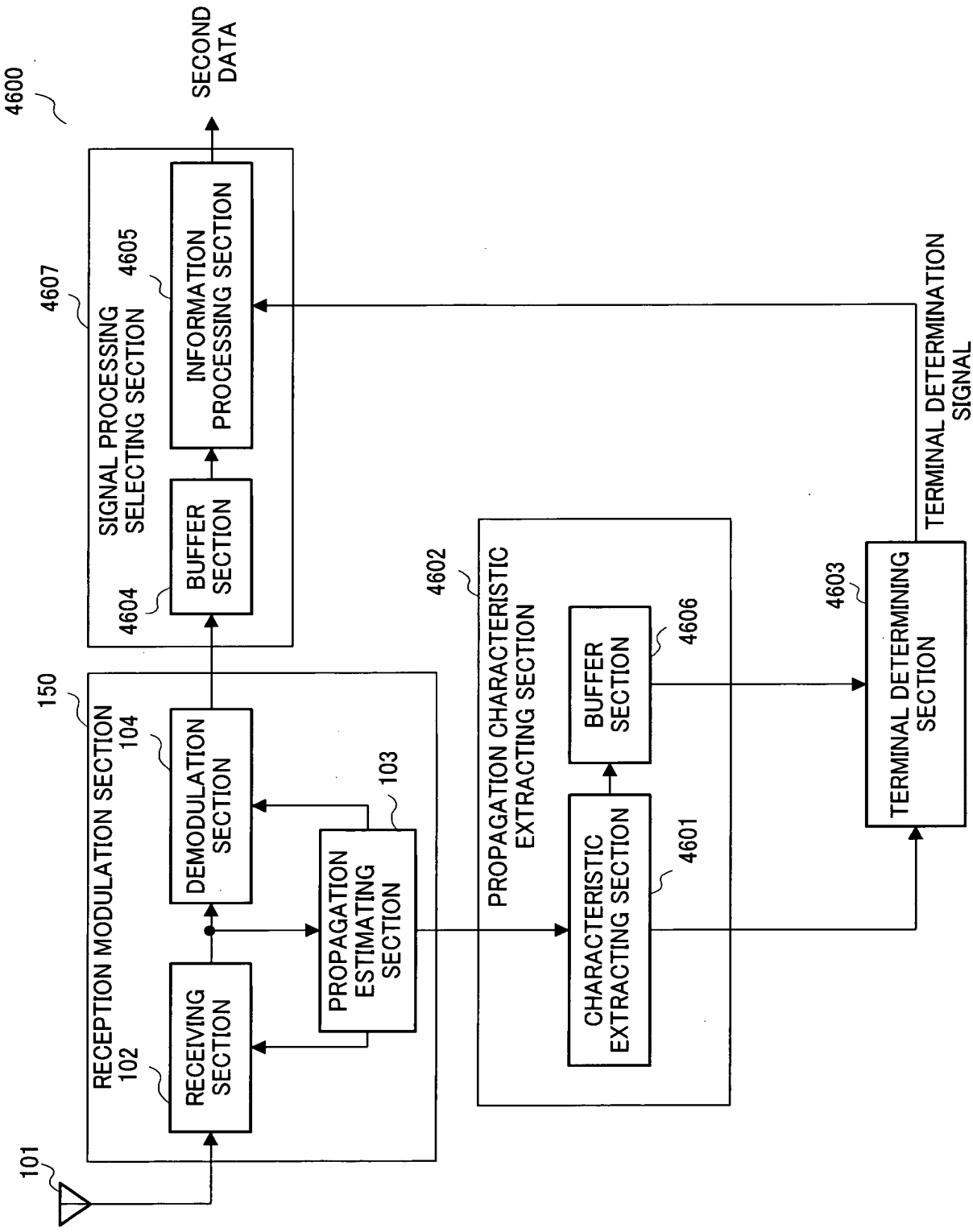

FIG.46

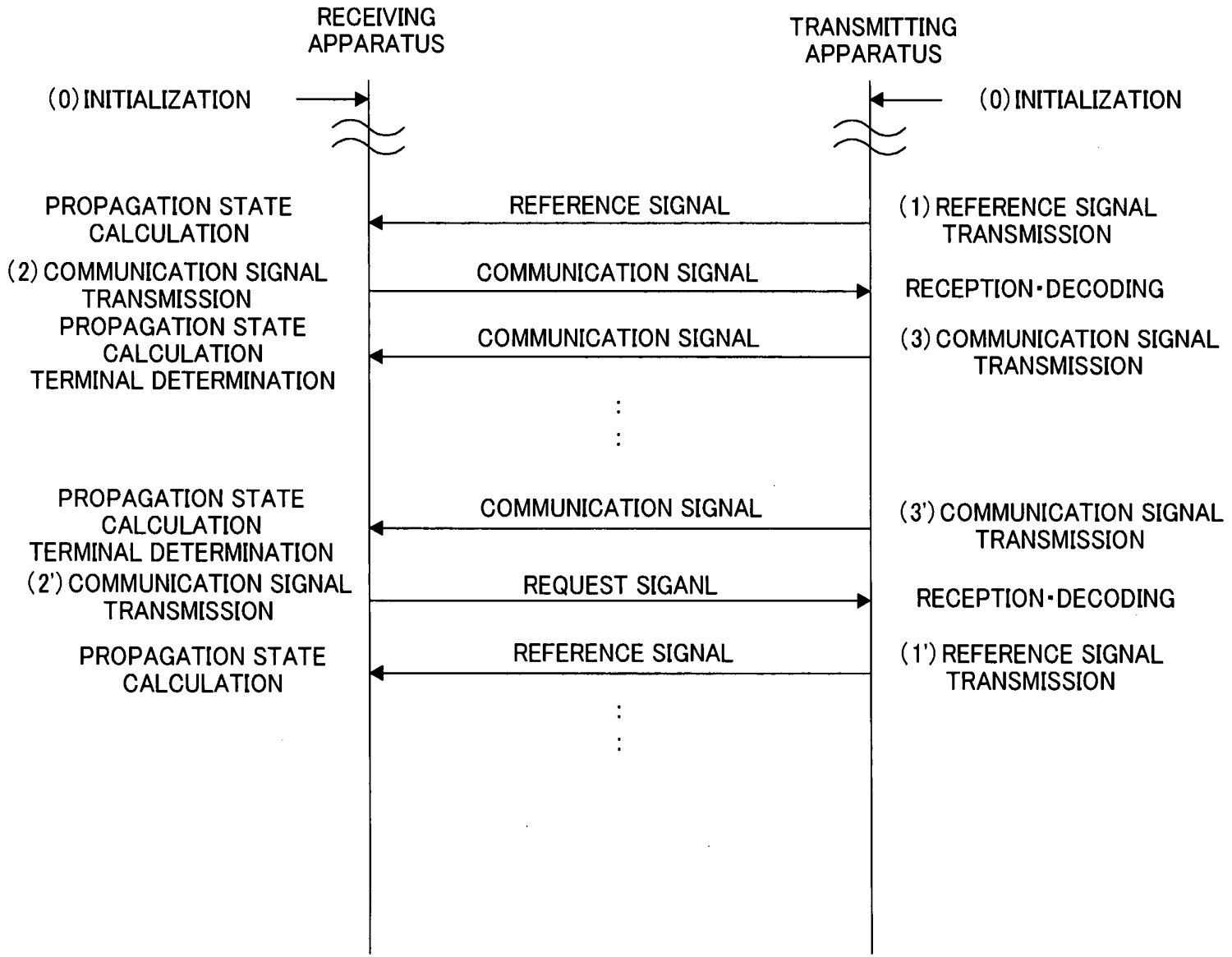

FIG.47

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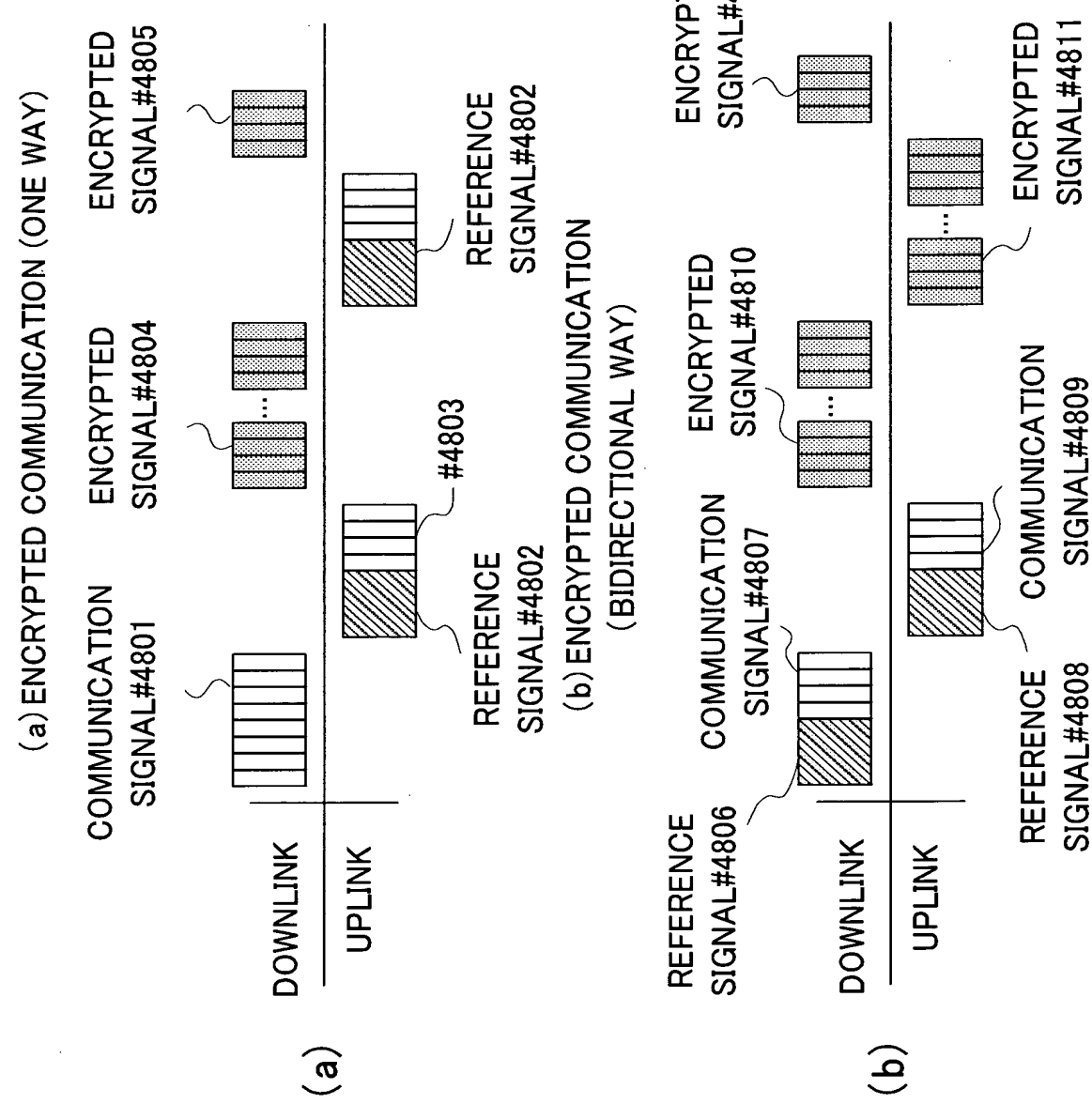
(a) ENCRYPTED COMMUNICATION (ONE WAY)
COMMUNICATION SIGNAL#4801
ENCRYPTED SIGNAL#4804
ENCRYPTED SIGNAL#4805
DOWNLINK
UPLINK
#4803
REFERENCE SIGNAL#4802
REFERENCE SIGNAL#4802
(a)
(b) ENCRYPTED COMMUNICATION (BIDIRECTIONAL WAY)
REFERENCE SIGNAL#4806
COMMUNICATION SIGNAL#4807
ENCRYPTED SIGNAL#4810
ENCRYPTED SIGNAL#4812
DOWNLINK
UPLINK
REFERENCE SIGNAL#4808
COMMUNICATION SIGNAL#4809
ENCRYPTED SIGNAL#4811
(b)

FIG.48

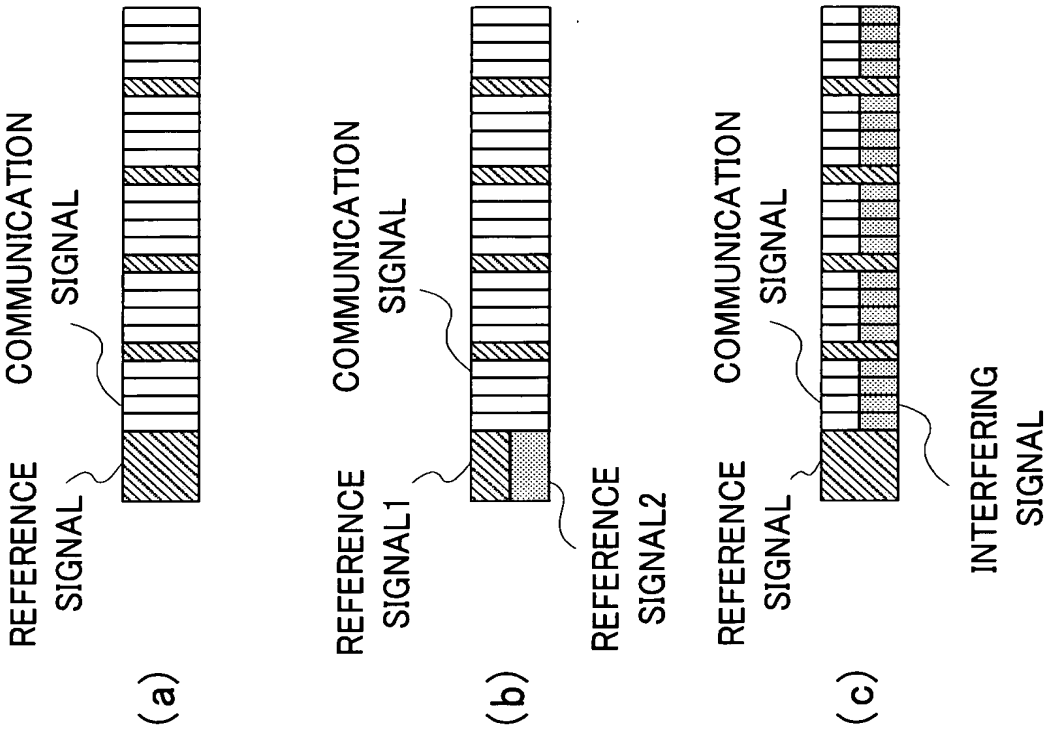
REFERENCE SIGNAL
COMMUNICATION SIGNAL
(a)
REFERENCE SIGNAL1
COMMUNICATION SIGNAL
REFERENCE SIGNAL2
(b)
REFERENCE SIGNAL
COMMUNICATION SIGNAL
INTERFERING SIGNAL
(c)

FIG.49

(a) FRAME STRUCTURE1

PILOT SIGNAL	DATAn	DATAn	DATAn	DATAn	DATAn
	:	:	:	:	:
	DATA2	DATA2	DATA2	DATA2	DATA2
	DATA1	DATA1	DATA1	DATA1	DATA1

(b) FRAME STRUCTURE2

DATAn	DATAn	DATAn	DATAn	DATAn	DATAn
:	:	:	:	:	:
DATA1	DATA1	DATA1	DATA1	DATA1	DATA1
PILOT SIGNAL	PILOT SIGNAL	PILOT SIGNAL	PILOT SIGNAL	PILOT SIGNAL	PILOT SIGNAL

(c) FRAME STRUCTURE3

DATAn	DATAn	DATAn	DATAn	DATAn	DATAn
:	:	:	:	:	:
PILOT SIGNALm	PILOT SIGNALm	PILOT SIGNALm	PILOT SIGNALm	PILOT SIGNALm	PILOT SIGNALm
:	:	:	:	:	:
DATA1	DATA1	DATA1	DATA1	DATA1	DATA1
PILOT SIGNAL1	PILOT SIGNAL1	PILOT SIGNAL1	PILOT SIGNAL1	PILOT SIGNAL1	PILOT SIGNAL1

FIG.50

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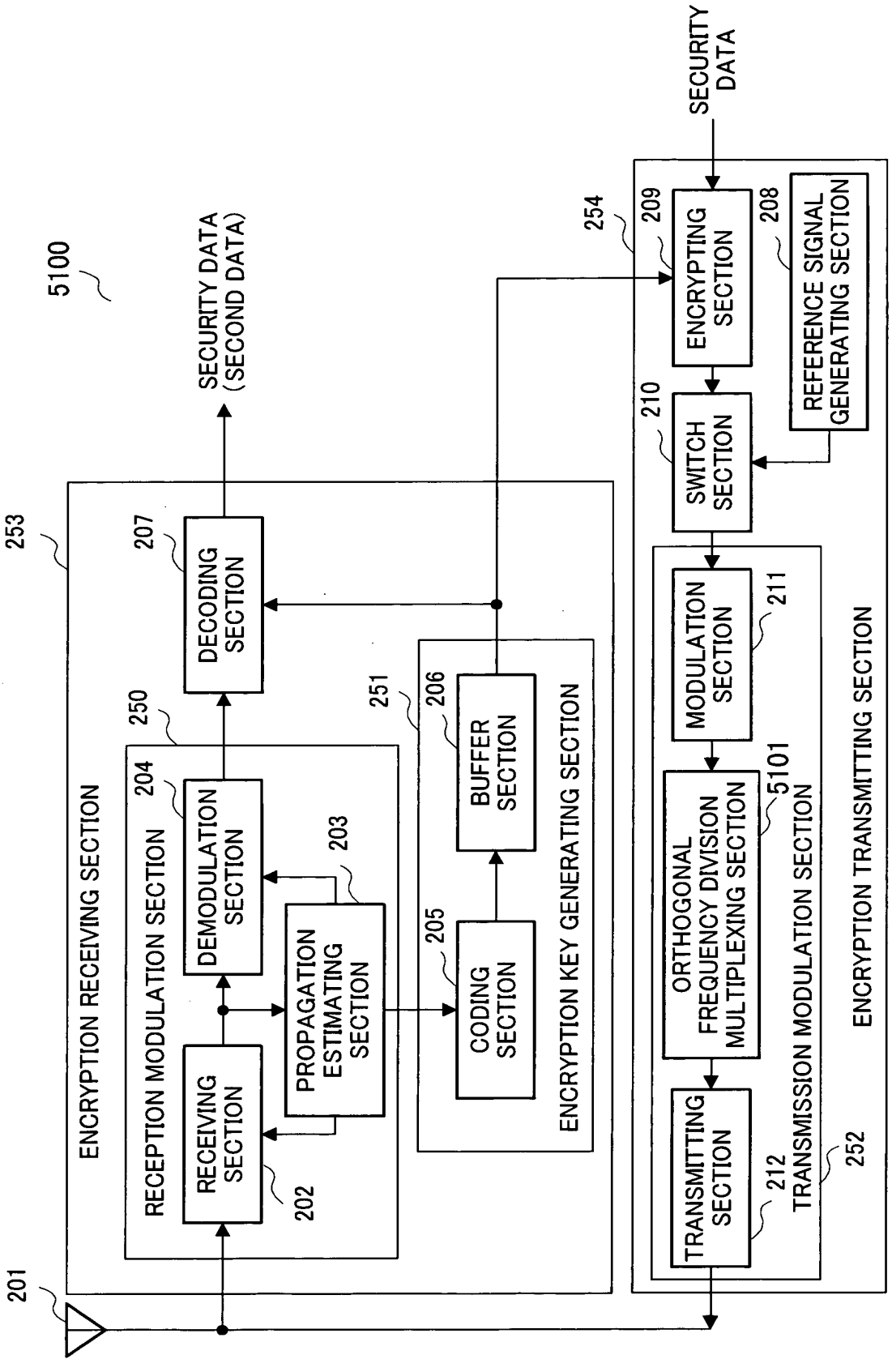
5100
SECURITY DATA (SECOND DATA)
SECURITY DATA
253
254
ENCRYPTION RECEIVING SECTION
RECEPTION MODULATION SECTION
250
RECEIVING SECTION
202
DEMODULATION SECTION
204
DECODING SECTION
207
PROPAGATION ESTIMATING SECTION
203
ENCRYPTION KEY GENERATING SECTION
251
CODING SECTION
205
BUFFER SECTION
206
ENCRYPTING SECTION
209
REFERENCE SIGNAL GENERATING SECTION
208
SWITCH SECTION
210
MODULATION SECTION
211
ORTHOGONAL FREQUENCY DIVISION MULTIPLEXING SECTION
5101
TRANSMITTING SECTION
212
TRANSMISSION MODULATION SECTION
252
ENCRYPTION TRANSMITTING SECTION
201

FIG.51

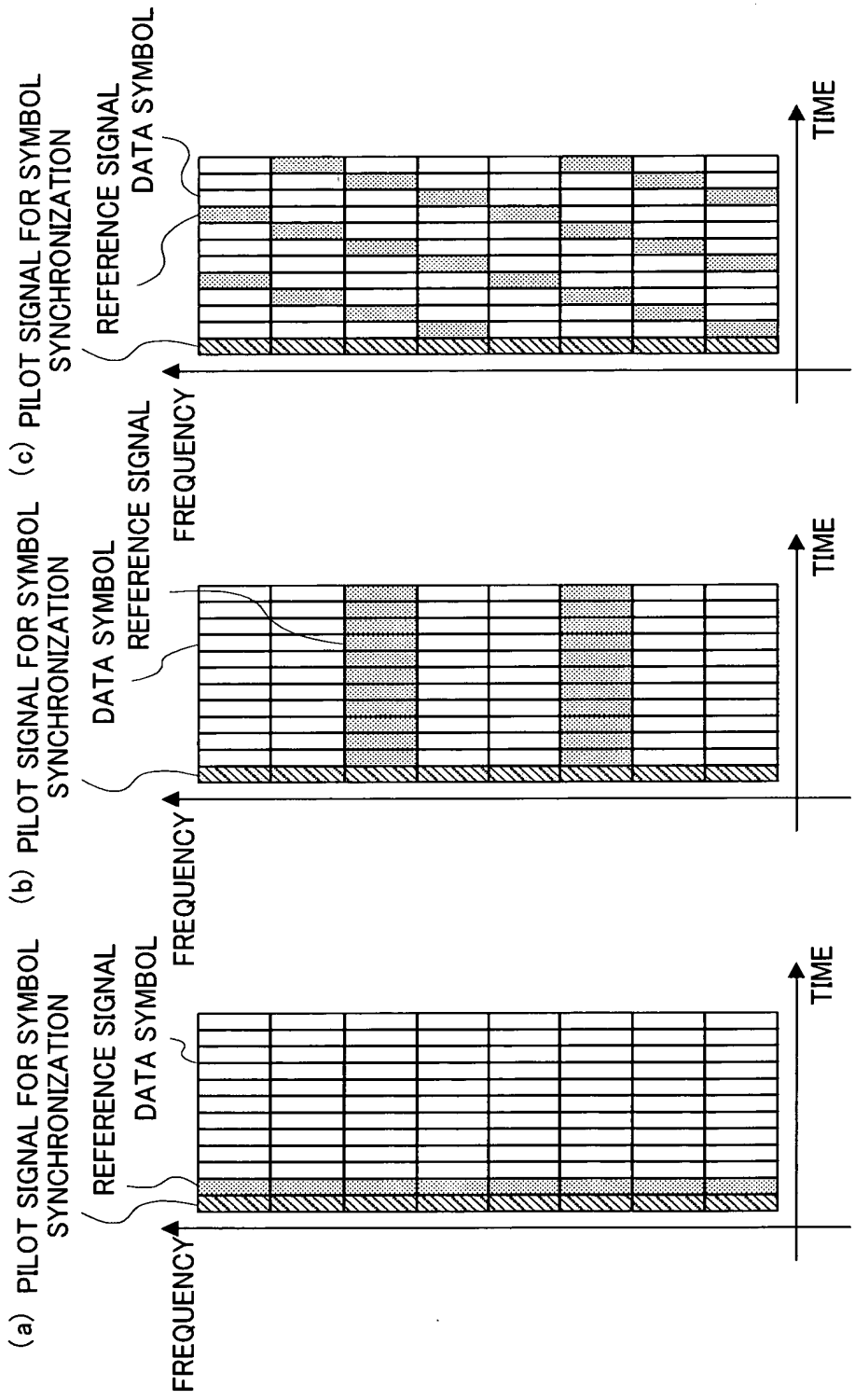
(a) PILOT SIGNAL FOR SYMBOL SYNCHRONIZATION
REFERENCE SIGNAL
DATA SYMBOL
FREQUENCY
TIME
(b) PILOT SIGNAL FOR SYMBOL SYNCHRONIZATION
DATA SYMBOL
REFERENCE SIGNAL
FREQUENCY
TIME
(c) PILOT SIGNAL FOR SYMBOL SYNCHRONIZATION
REFERENCE SIGNAL
DATA SYMBOL
FREQUENCY
TIME

FIG.52

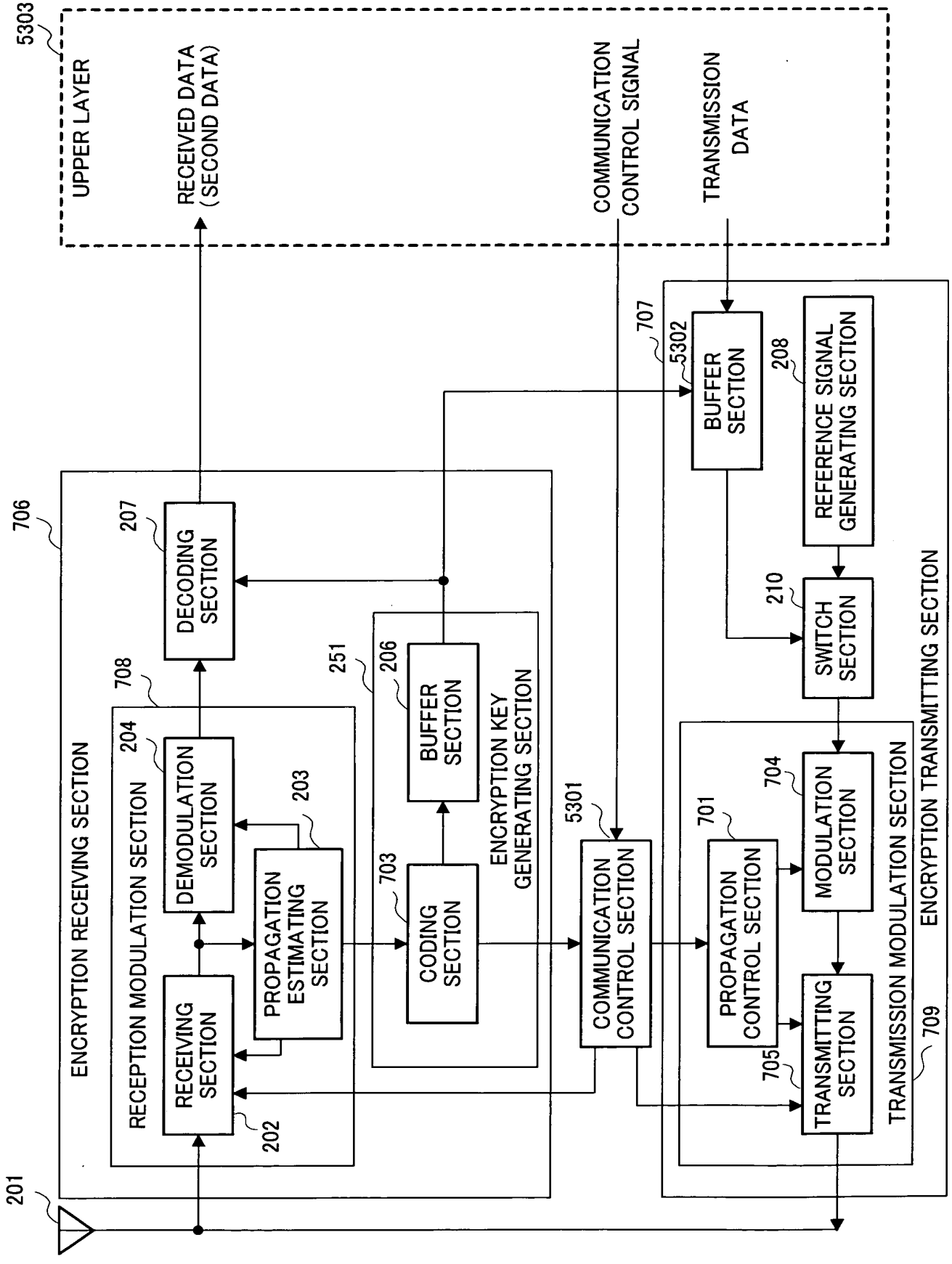
5303
UPPER LAYER
RECEIVED DATA (SECOND DATA)
COMMUNICATION CONTROL SIGNAL
TRANSMISSION DATA
706
ENCRYPTION RECEIVING SECTION
207
DECODING SECTION
708
RECEPTION MODULATION SECTION
204
DEMODULATION SECTION
203
PROPAGATION ESTIMATING SECTION
RECEIVING SECTION
202
251
206
BUFFER SECTION
703
CODING SECTION
ENCRYPTION KEY GENERATING SECTION
5301
COMMUNICATION CONTROL SECTION
707
5302
BUFFER SECTION
208
REFERENCE SIGNAL GENERATING SECTION
210
SWITCH SECTION
701
PROPAGATION CONTROL SECTION
704
MODULATION SECTION
705
TRANSMITTING SECTION
TRANSMISSION MODULATION SECTION
709
ENCRYPTION TRANSMITTING SECTION
201

FIG.53

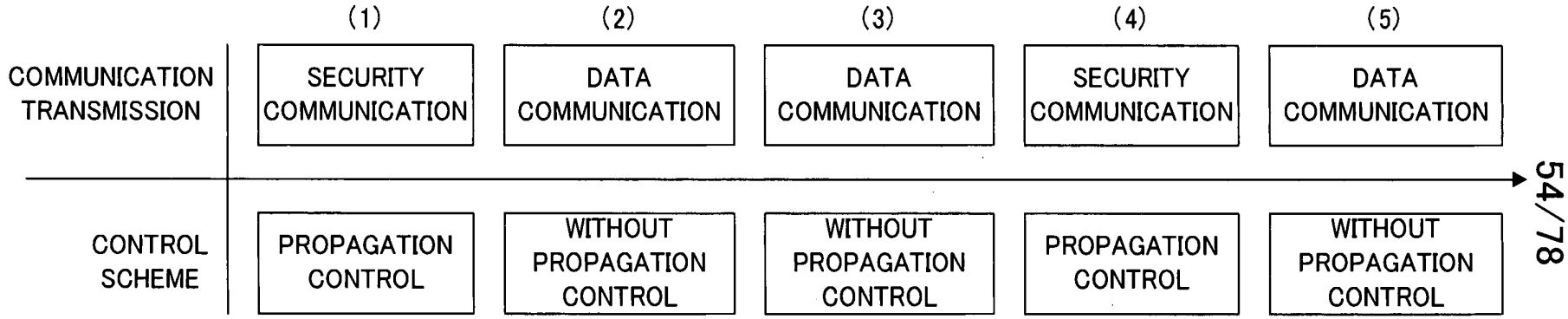

FIG.54

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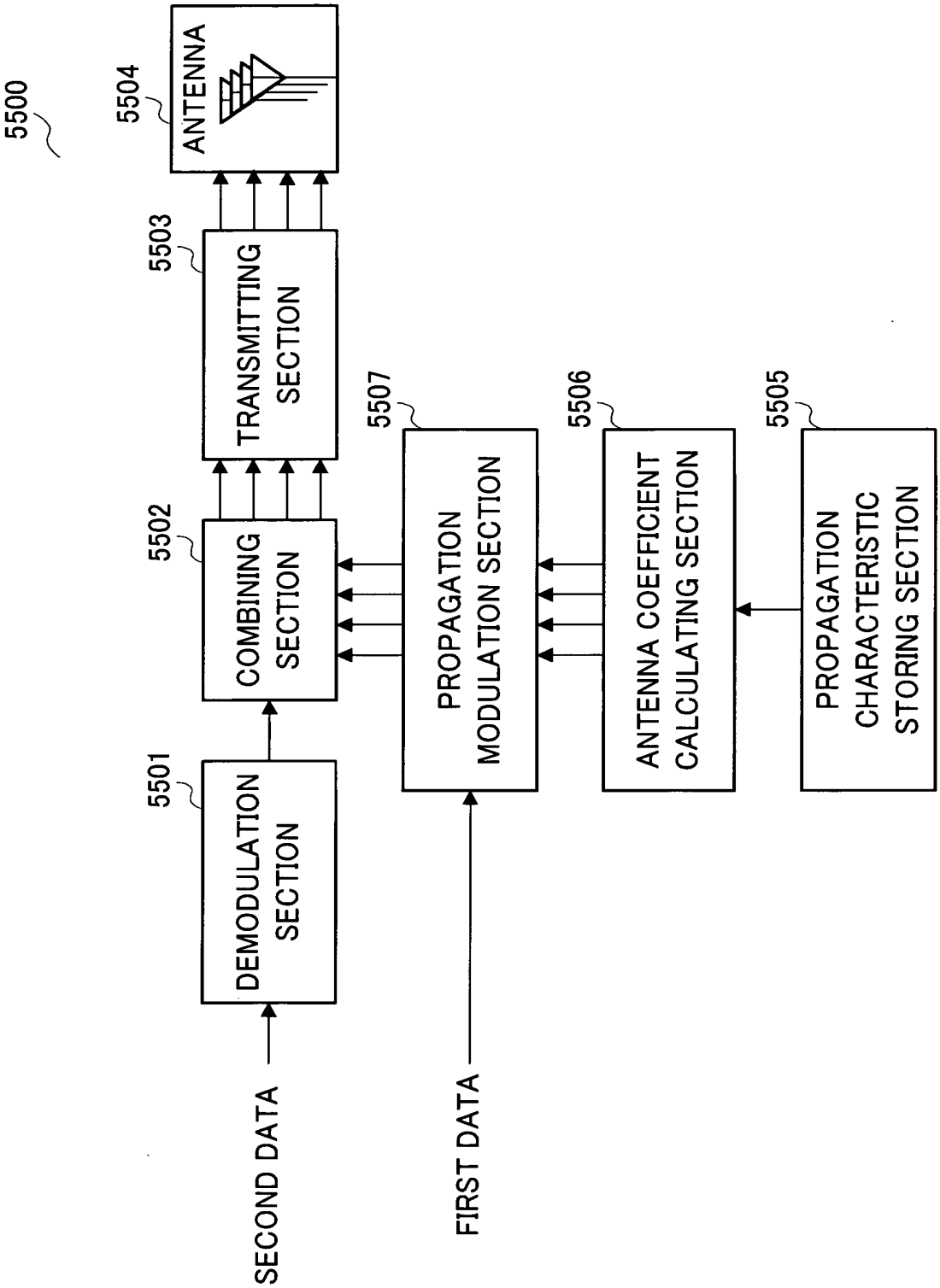
5500
5504
ANTENNA
5503
TRANSMITTING SECTION
5502
COMBINING SECTION
5501
DEMODULATION SECTION
SECOND DATA
5507
PROPAGATION MODULATION SECTION
FIRST DATA
5506
ANTENNA COEFFICIENT CALCULATING SECTION
5505
PROPAGATION CHARACTERISTIC STORING SECTION

FIG.55

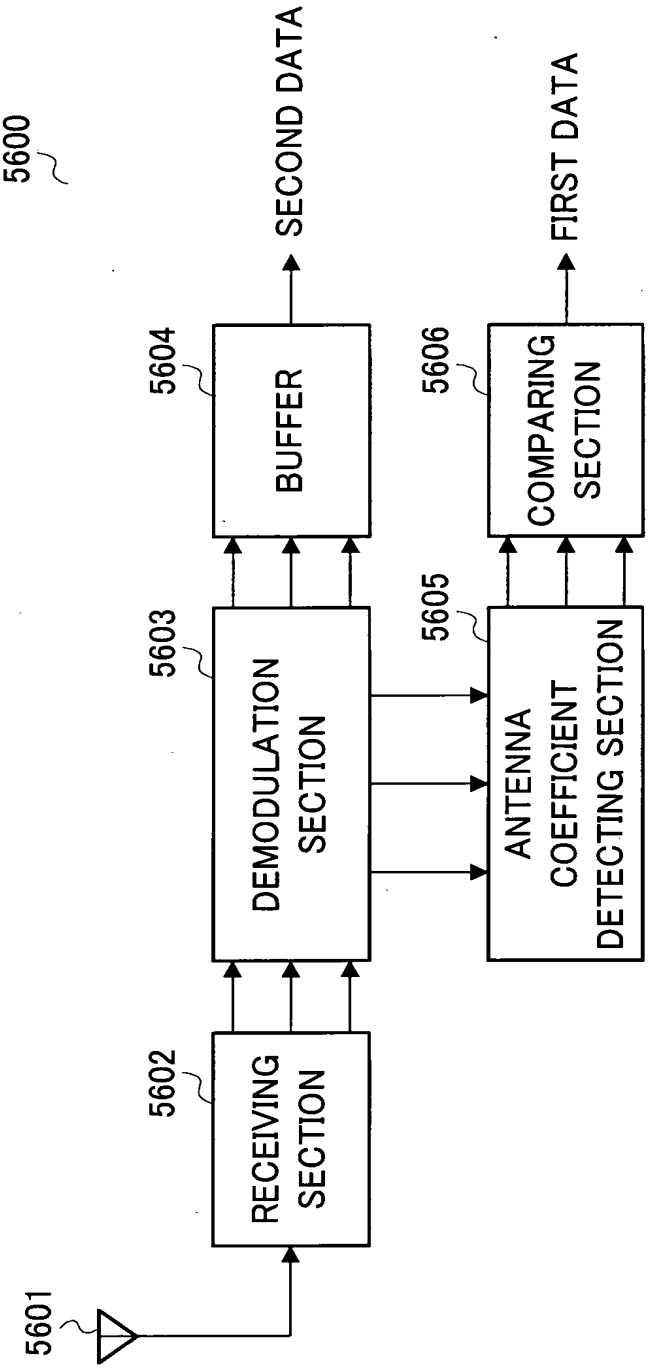
5600
SECOND DATA
FIRST DATA
5604
BUFFER
5606
COMPARING SECTION
5603
DEMODULATION SECTION
5605
ANTENNA COEFFICIENT DETECTING SECTION
5602
RECEIVING SECTION
5601

FIG.56

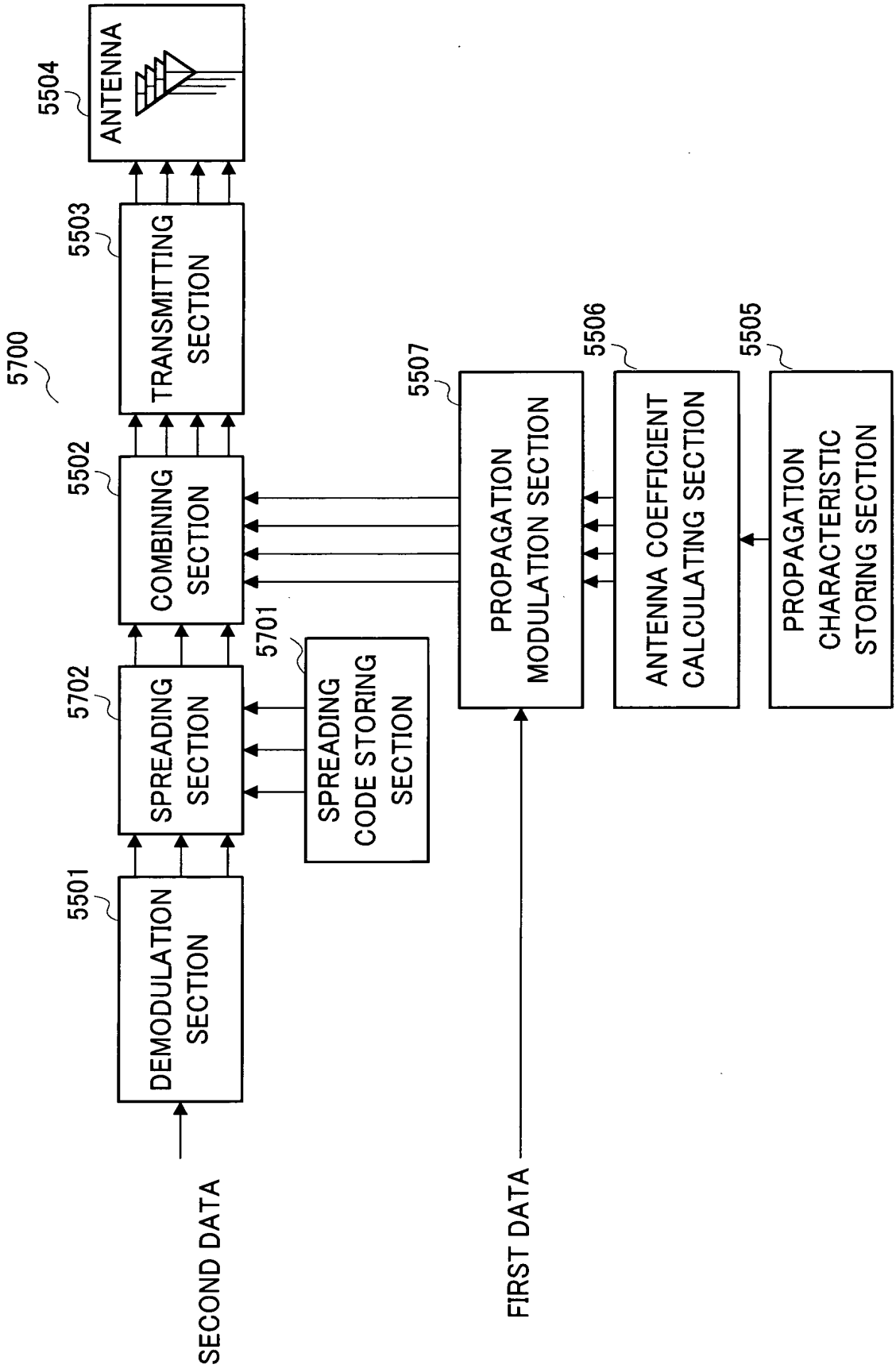
5700
5504
ANTENNA
5503
TRANSMITTING SECTION
5502
COMBINING SECTION
5702
SPREADING SECTION
5701
SPREADING CODE STORING SECTION
5501
DEMODULATION SECTION
SECOND DATA
5507
PROPAGATION MODULATION SECTION
FIRST DATA
5506
ANTENNA COEFFICIENT CALCULATING SECTION
5505
PROPAGATION CHARACTERISTIC STORING SECTION

FIG.57

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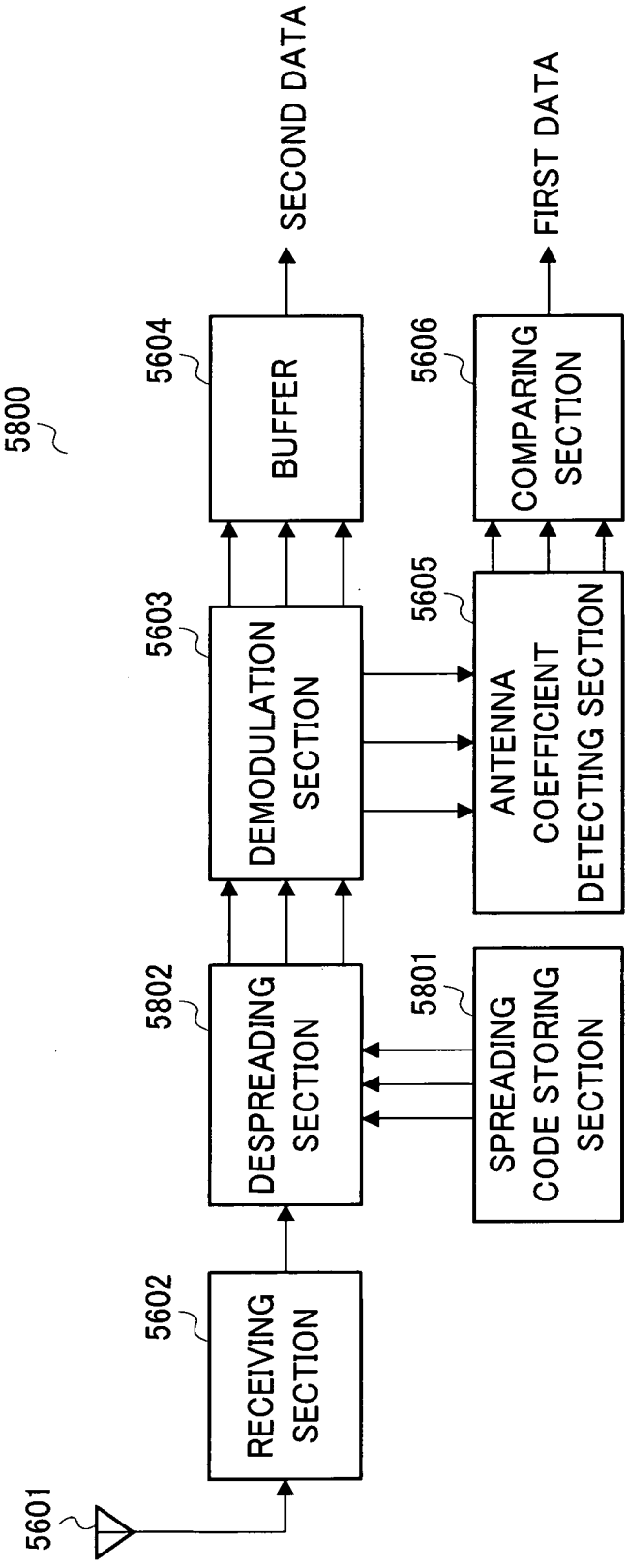

FIG.58

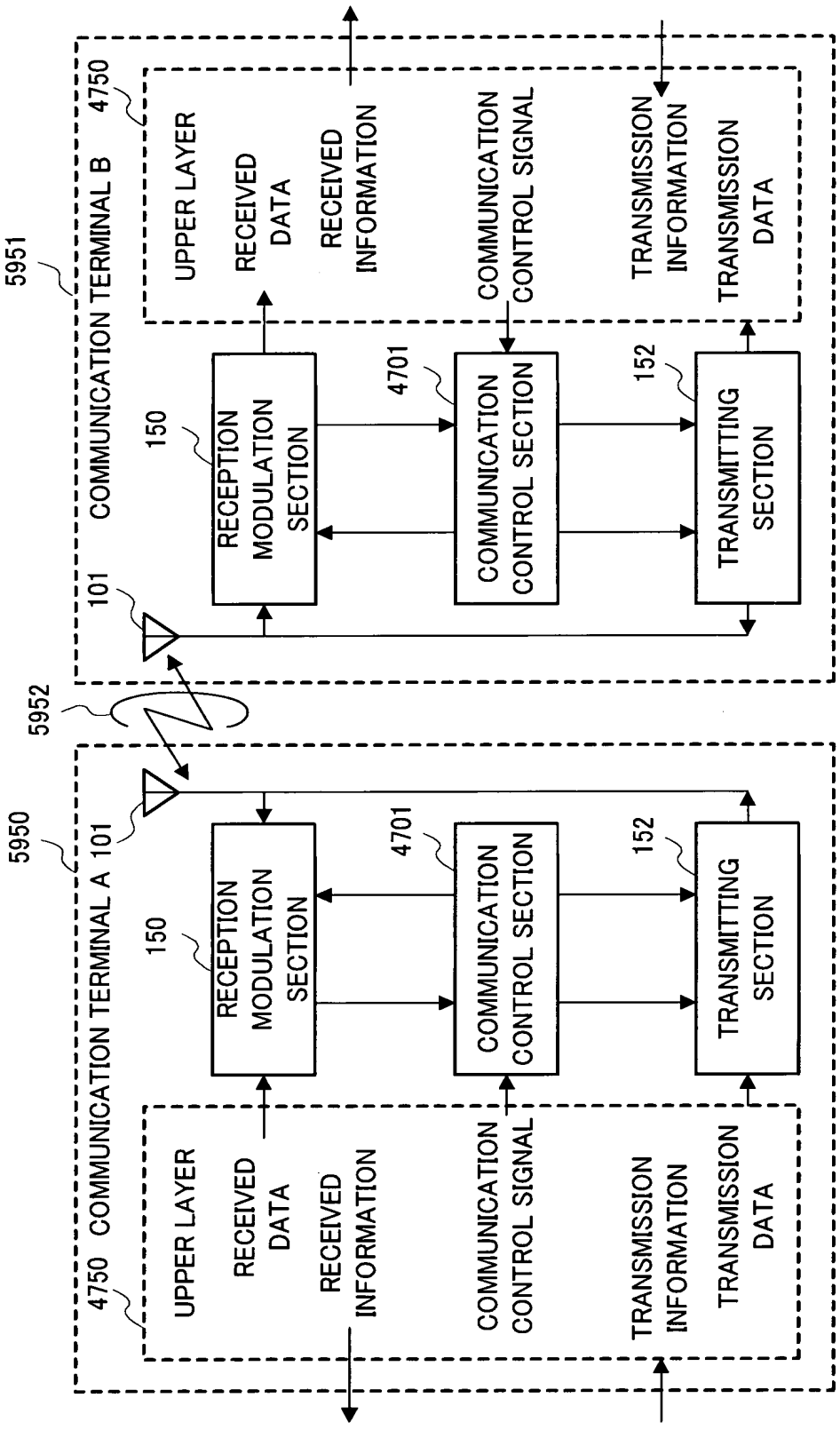
5951
COMMUNICATION TERMINAL B
4750
UPPER LAYER
RECEIVED DATA
RECEIVED INFORMATION
COMMUNICATION CONTROL SIGNAL
TRANSMISSION INFORMATION
TRANSMISSION DATA
150
RECEPTION MODULATION SECTION
4701
COMMUNICATION CONTROL SECTION
152
TRANSMITTING SECTION
101
5952
5950
COMMUNICATION TERMINAL A
101
4750
UPPER LAYER
RECEIVED DATA
RECEIVED INFORMATION
COMMUNICATION CONTROL SIGNAL
TRANSMISSION INFORMATION
TRANSMISSION DATA
150
RECEPTION MODULATION SECTION
4701
COMMUNICATION CONTROL SECTION
152
TRANSMITTING SECTION

FIG.59

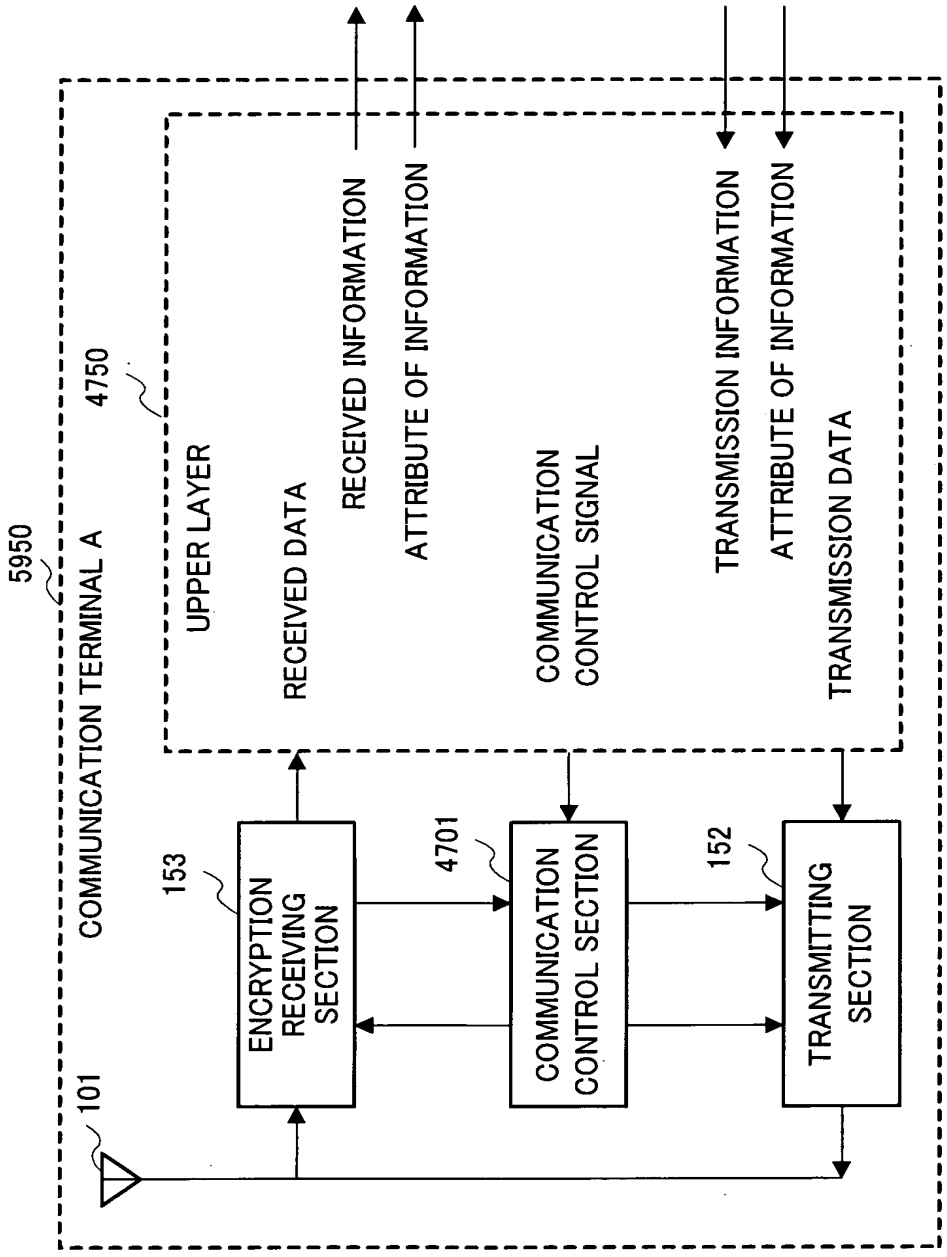
5950
COMMUNICATION TERMINAL A
4750
UPPER LAYER
RECEIVED DATA
RECEIVED INFORMATION
ATTRIBUTE OF INFORMATION
COMMUNICATION CONTROL SIGNAL
TRANSMISSION INFORMATION
ATTRIBUTE OF INFORMATION
TRANSMISSION DATA
153
ENCRYPTION RECEIVING SECTION
4701
COMMUNICATION CONTROL SECTION
152
TRANSMITTING SECTION
101

FIG.60

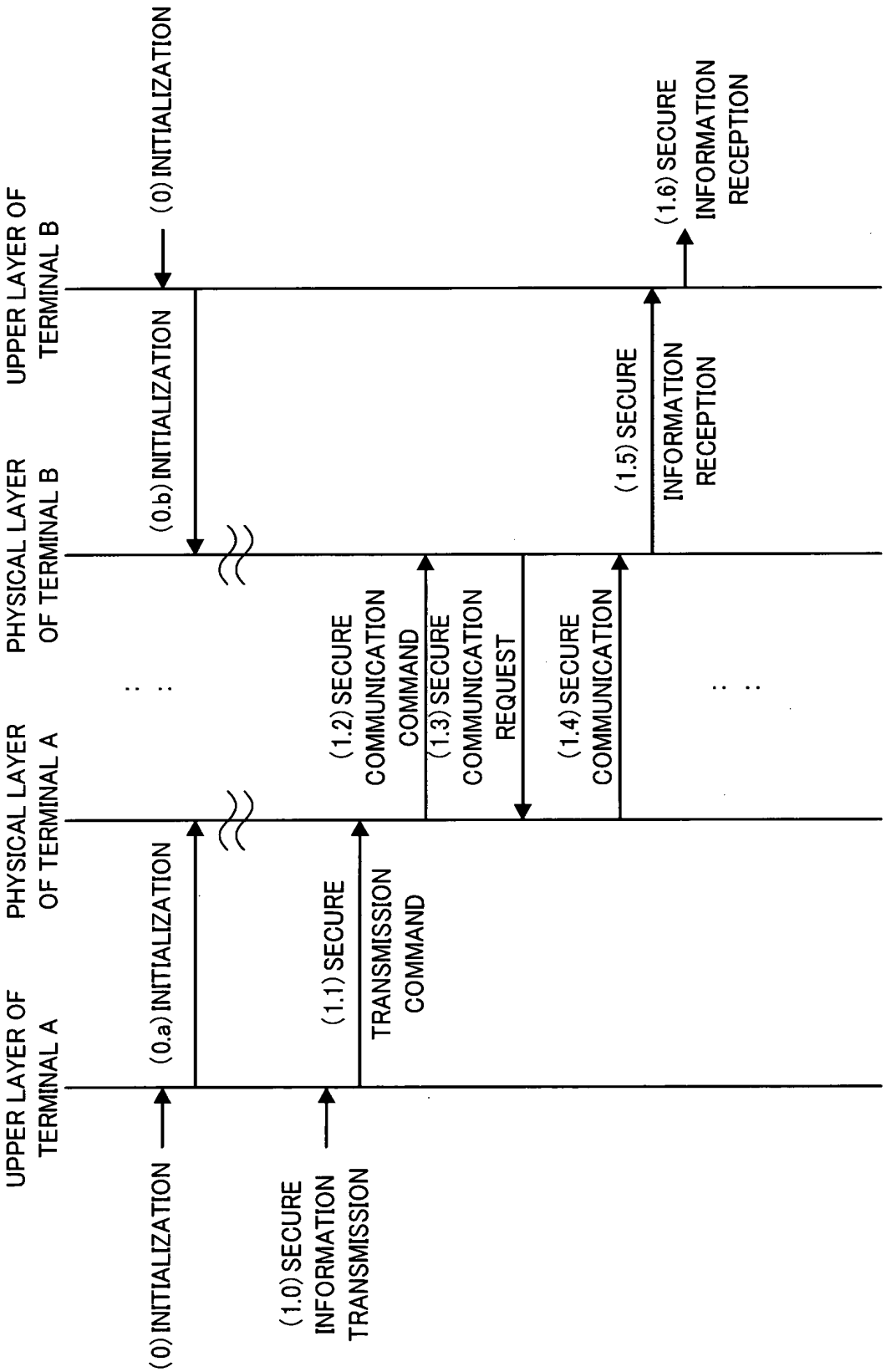
UPPER LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL B
UPPER LAYER OF TERMINAL B
(0) INITIALIZATION
(0.a) INITIALIZATION
(0.b) INITIALIZATION
(0) INITIALIZATION
(1.0) SECURE INFORMATION TRANSMISSION
(1.1) SECURE TRANSMISSION COMMAND
(1.2) SECURE COMMUNICATION COMMAND
(1.3) SECURE COMMUNICATION REQUEST
(1.4) SECURE COMMUNICATION
(1.5) SECURE INFORMATION RECEPTION
(1.6) SECURE INFORMATION RECEPTION

FIG.61

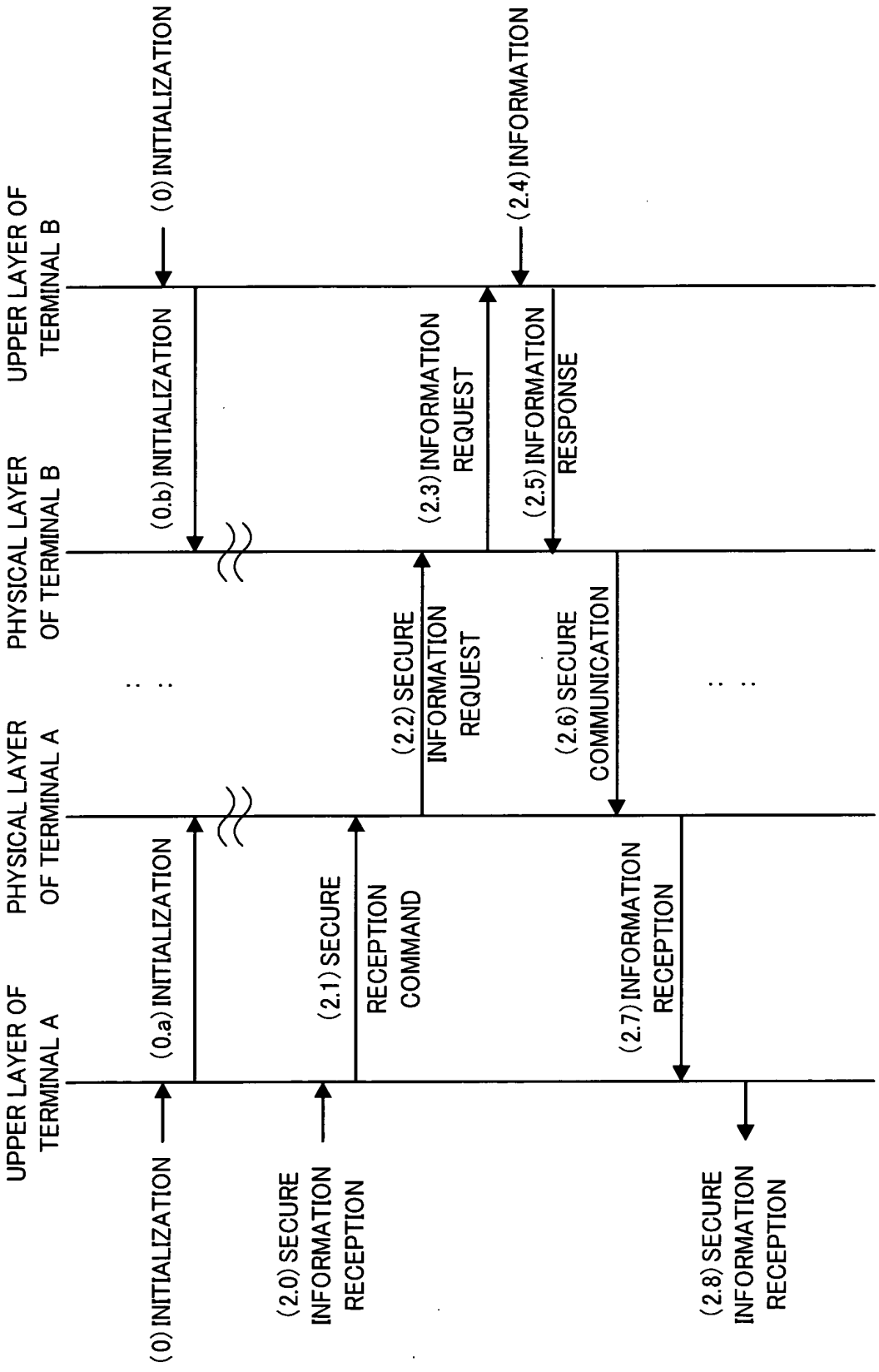
UPPER LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL B
UPPER LAYER OF TERMINAL B
(0) INITIALIZATION
(0.a) INITIALIZATION
(0.b) INITIALIZATION
(0) INITIALIZATION
(2.0) SECURE INFORMATION RECEPTION
(2.1) SECURE RECEPTION COMMAND
(2.2) SECURE INFORMATION REQUEST
(2.3) INFORMATION REQUEST
(2.4) INFORMATION
(2.5) INFORMATION RESPONSE
(2.6) SECURE COMMUNICATION
(2.7) INFORMATION RECEPTION
(2.8) SECURE INFORMATION RECEPTION

FIG.62

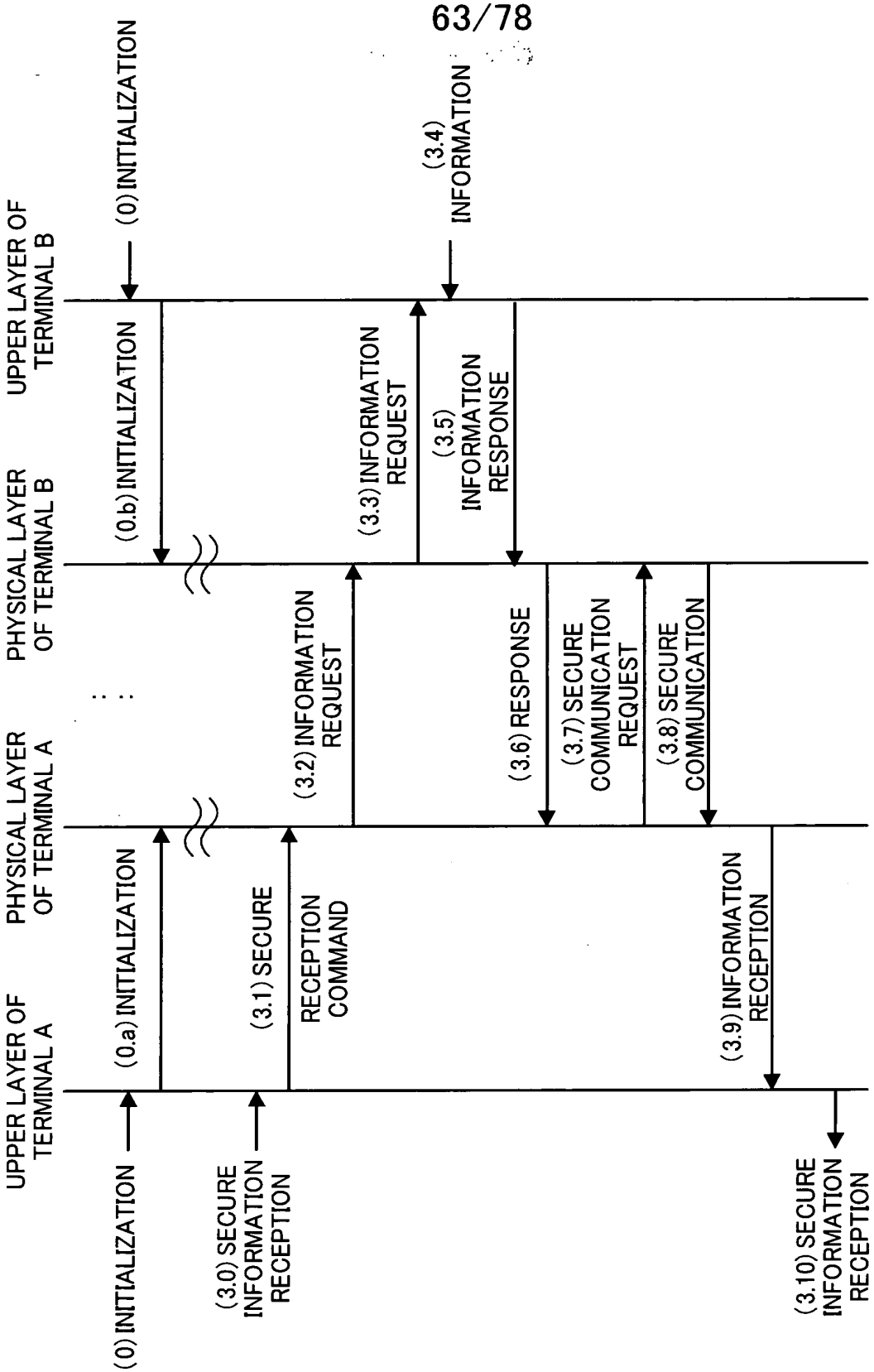
UPPER LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL A
PHYSICAL LAYER OF TERMINAL B
UPPER LAYER OF TERMINAL B
(0) INITIALIZATION
(0.a) INITIALIZATION
(0.b) INITIALIZATION
(0) INITIALIZATION
(3.0) SECURE INFORMATION RECEPTION
(3.1) SECURE RECEPTION COMMAND
(3.2) INFORMATION REQUEST
(3.3) INFORMATION REQUEST
(3.4) INFORMATION
(3.5) INFORMATION RESPONSE
(3.6) RESPONSE
(3.7) SECURE COMMUNICATION REQUEST
(3.8) SECURE COMMUNICATION
(3.9) INFORMATION RECEPTION
(3.10) SECURE INFORMATION RECEPTION

FIG.63

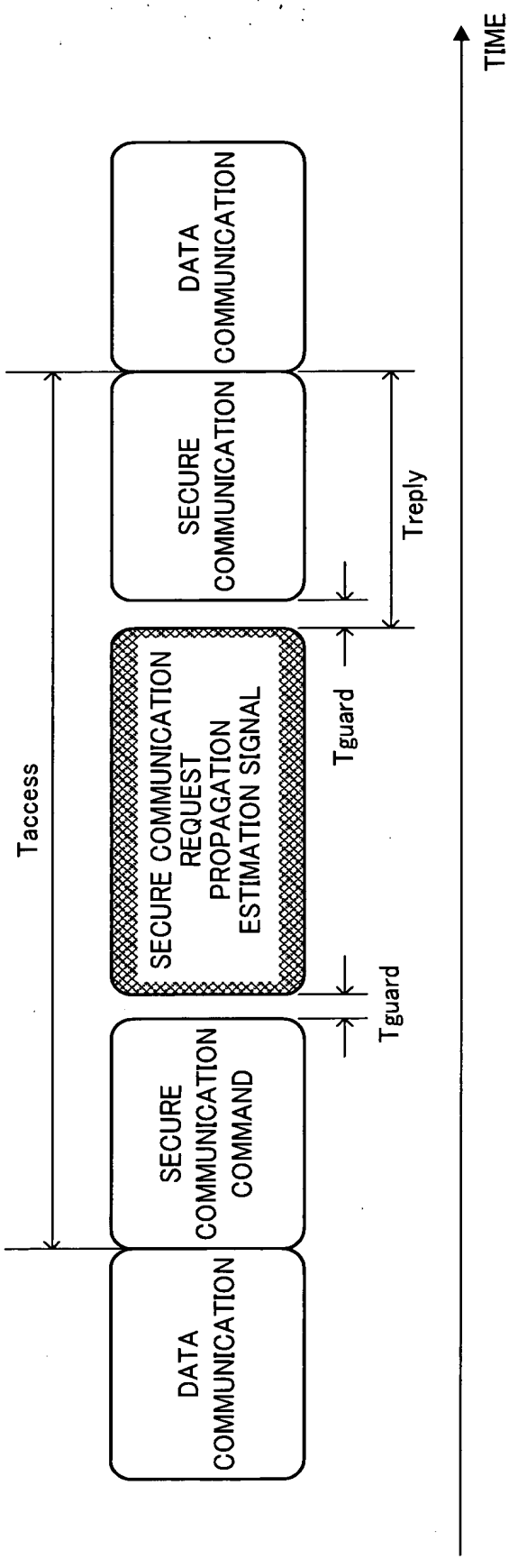
TIME
DATA COMMUNICATION
SECURE COMMUNICATION
SECURE COMMUNICATION REQUEST PROPAGATION ESTIMATION SIGNAL
SECURE COMMUNICATION COMMAND
DATA COMMUNICATION
Taccess
Treply
Tguard
Tguard

FIG.64

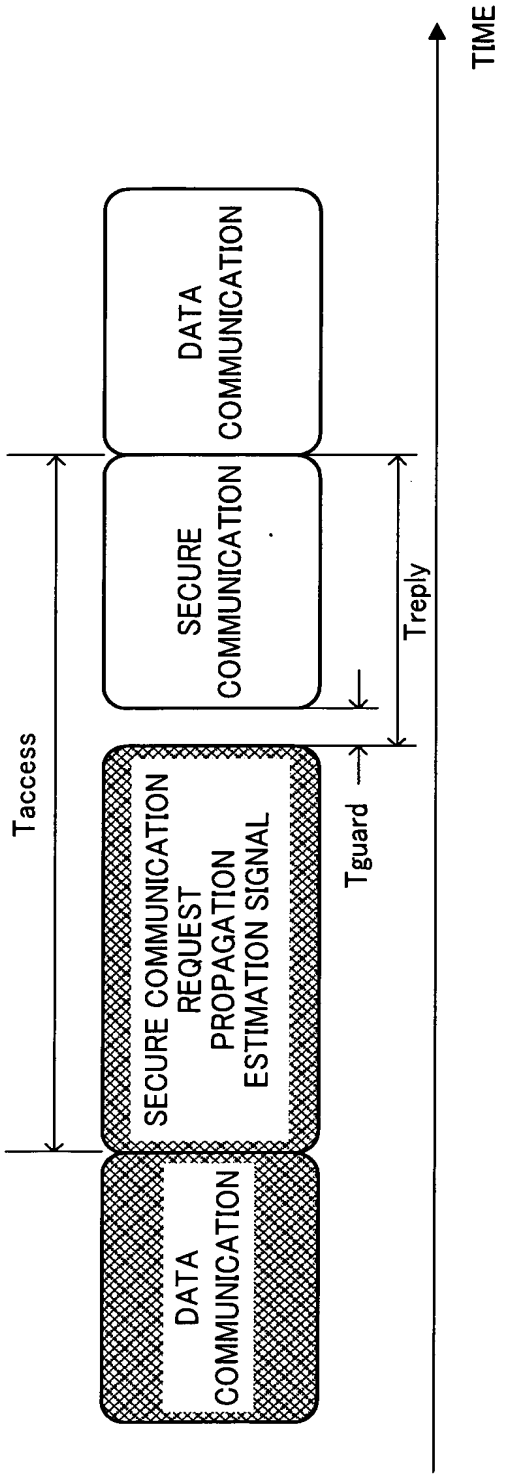
TIME
DATA COMMUNICATION
SECURE COMMUNICATION
Treply
Taccess
SECURE COMMUNICATION REQUEST PROPAGATION ESTIMATION SIGNAL
Tguard
DATA COMMUNICATION

FIG.65

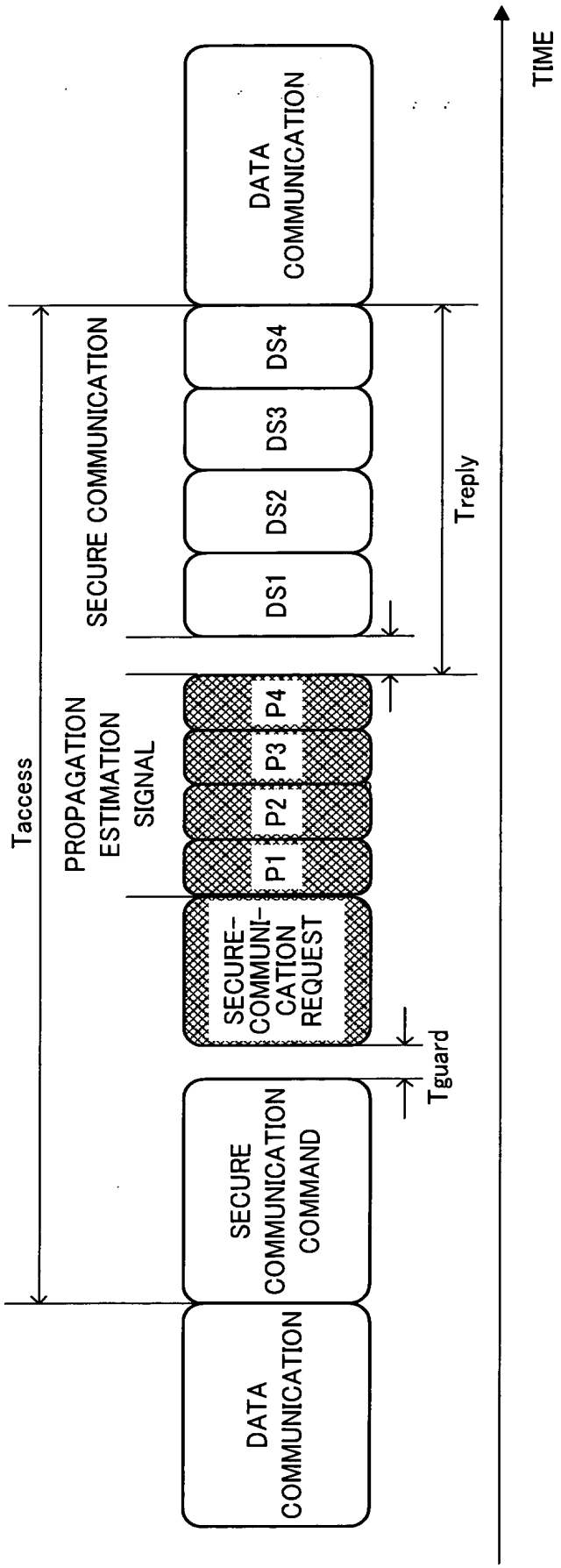
TIME
DATA COMMUNICATION
SECURE COMMUNICATION
DS1
DS2
DS3
DS4
Treply
PROPAGATION ESTIMATION SIGNAL
P1
P2
P3
P4
SECURE-COMMUNI-CATION REQUEST
Tguard
SECURE COMMUNICATION COMMAND
DATA COMMUNICATION
Taccess

FIG.66

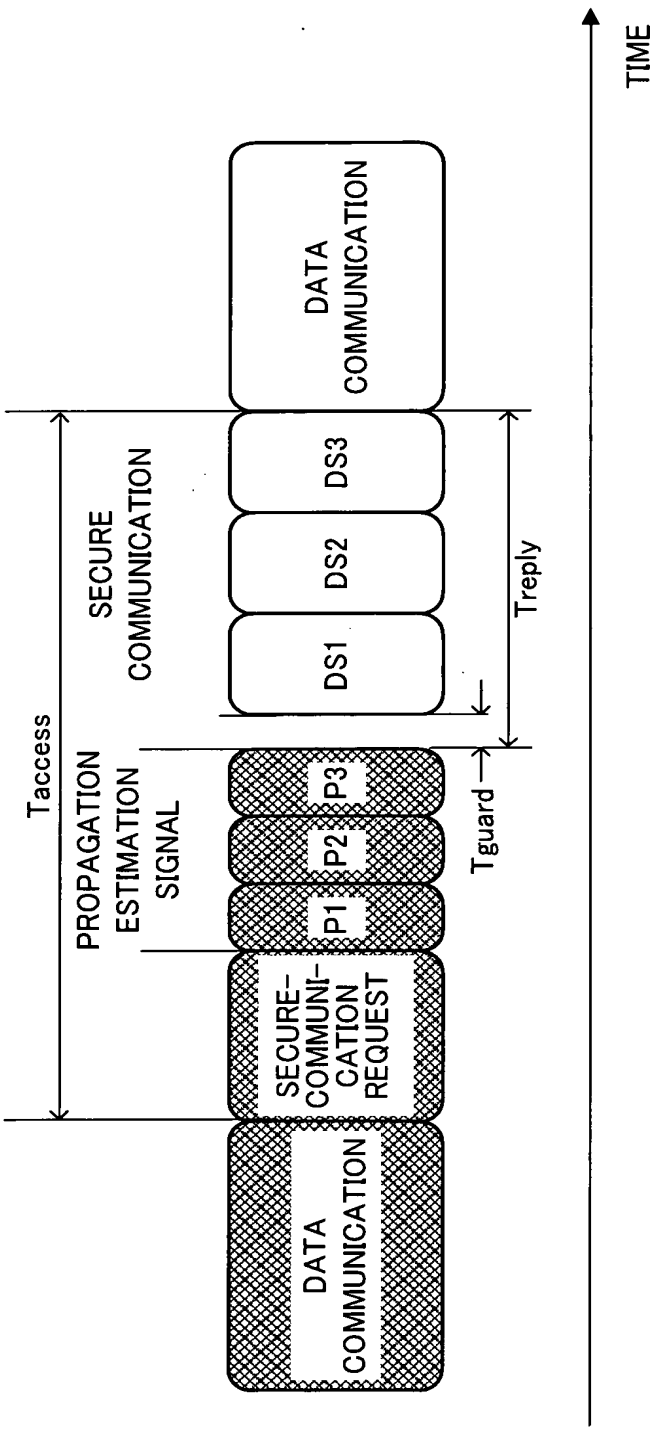
TIME
DATA COMMUNICATION
DS3
DS2
DS1
Treply
Tguard
SECURE COMMUNICATION
Taccess
PROPAGATION ESTIMATION SIGNAL
P3
P2
P1
SECURE-COMMUNI-CATION REQUEST
DATA COMMUNICATION

FIG.67

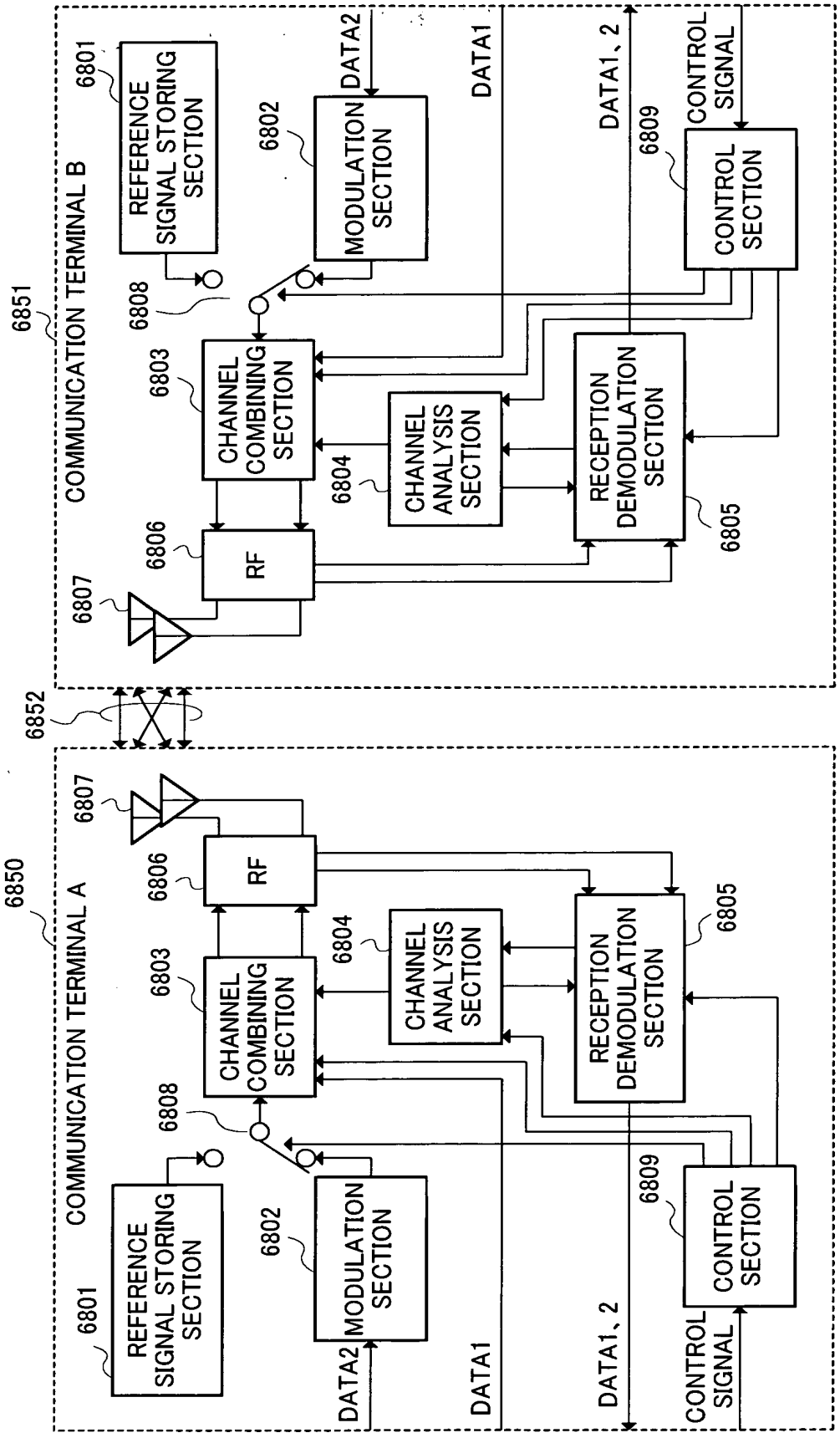
6850
COMMUNICATION TERMINAL A
6801
REFERENCE SIGNAL STORING SECTION
6802
MODULATION SECTION
DATA2
DATA1
6803
CHANNEL COMBINING SECTION
6804
CHANNEL ANALYSIS SECTION
6805
RECEPTION DEMODULATION SECTION
DATA1、2
6806
RF
6807
6808
6809
CONTROL SIGNAL
CONTROL SECTION
6851
COMMUNICATION TERMINAL B
6852

FIG.68

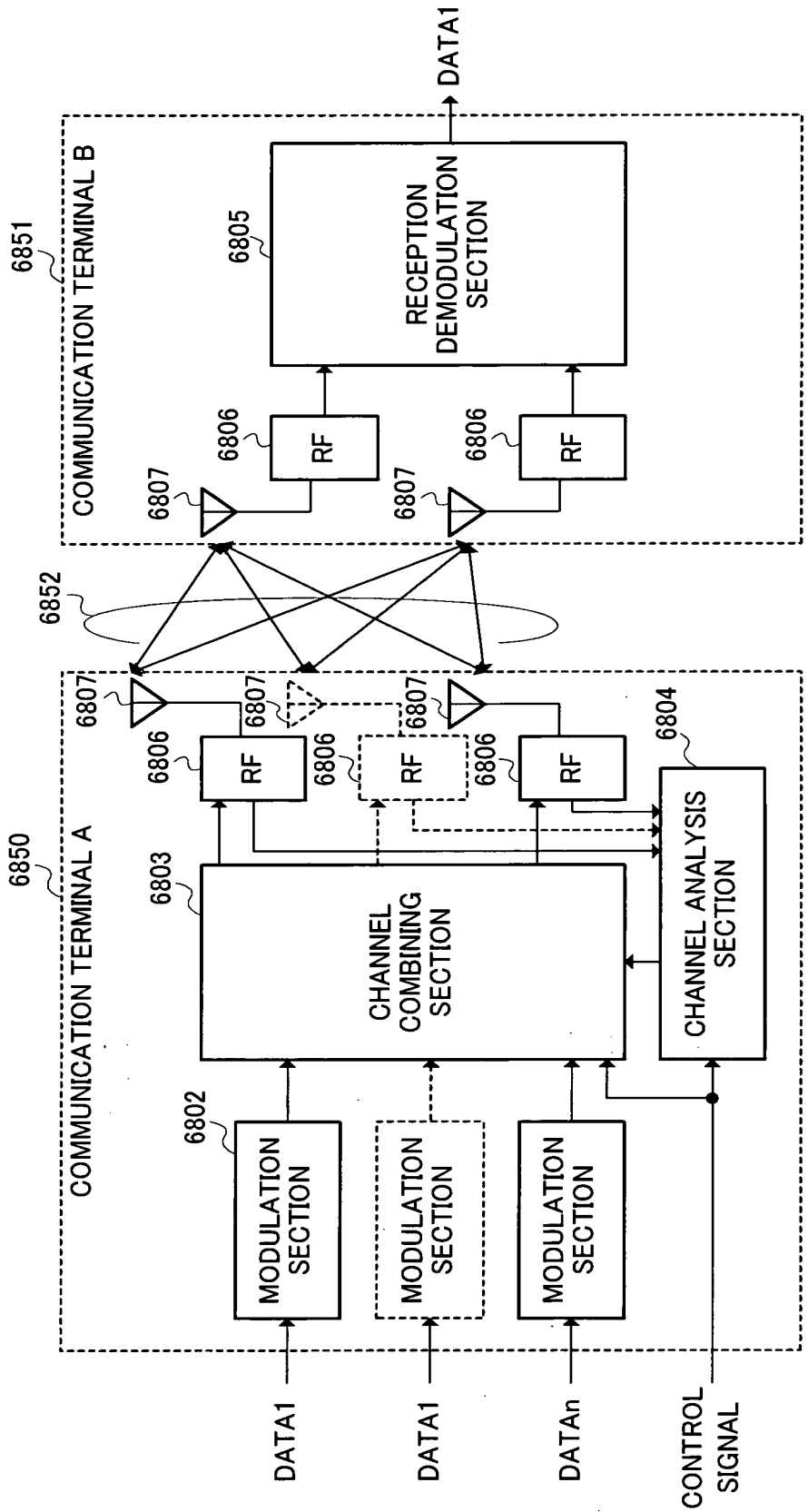
DATA1
6851
COMMUNICATION TERMINAL B
6805
RECEPTION DEMODULATION SECTION
6806
RF
6807
6852
6850
COMMUNICATION TERMINAL A
6804
CHANNEL ANALYSIS SECTION
6803
CHANNEL COMBINING SECTION
6802
MODULATION SECTION
DATA1
DATA1
DATAn
CONTROL SIGNAL

図69

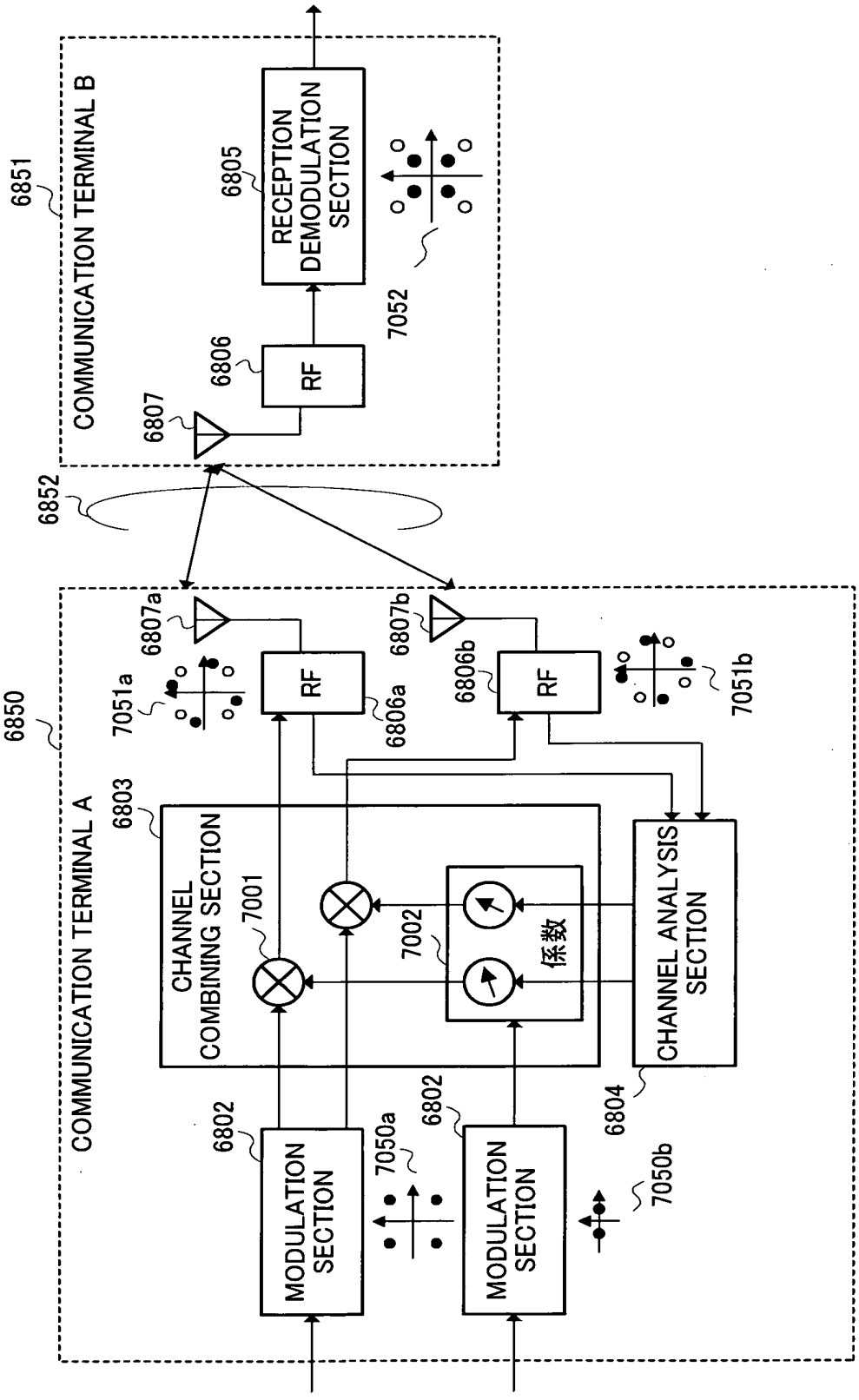
COMMUNICATION TERMINAL A
6850
COMMUNICATION TERMINAL B
6851
6852
CHANNEL COMBINING SECTION
6803
7001
7002
係数
CHANNEL ANALYSIS SECTION
6804
MODULATION SECTION
6802
MODULATION SECTION
6802
RF
6806a
RF
6806b
RF
6806
RECEPTION DEMODULATION SECTION
6805
6807a
6807b
6807
7050a
7050b
7051a
7051b
7052

FIG.70

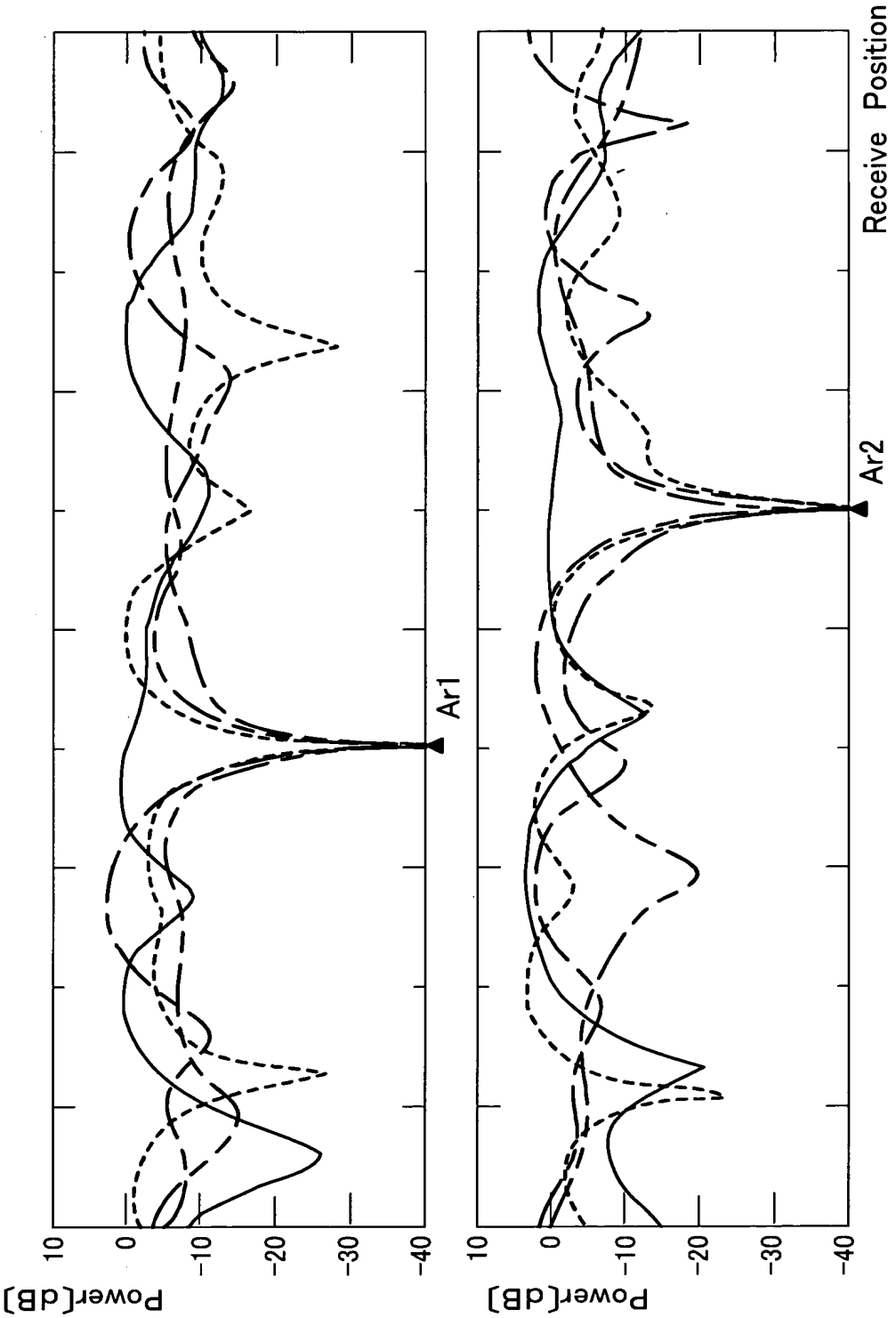
Power[dB]
10
0
-10
-20
-30
-40
Ar1
Power[dB]
10
0
-10
-20
-30
-40
Ar2
Receive Position

FIG.71

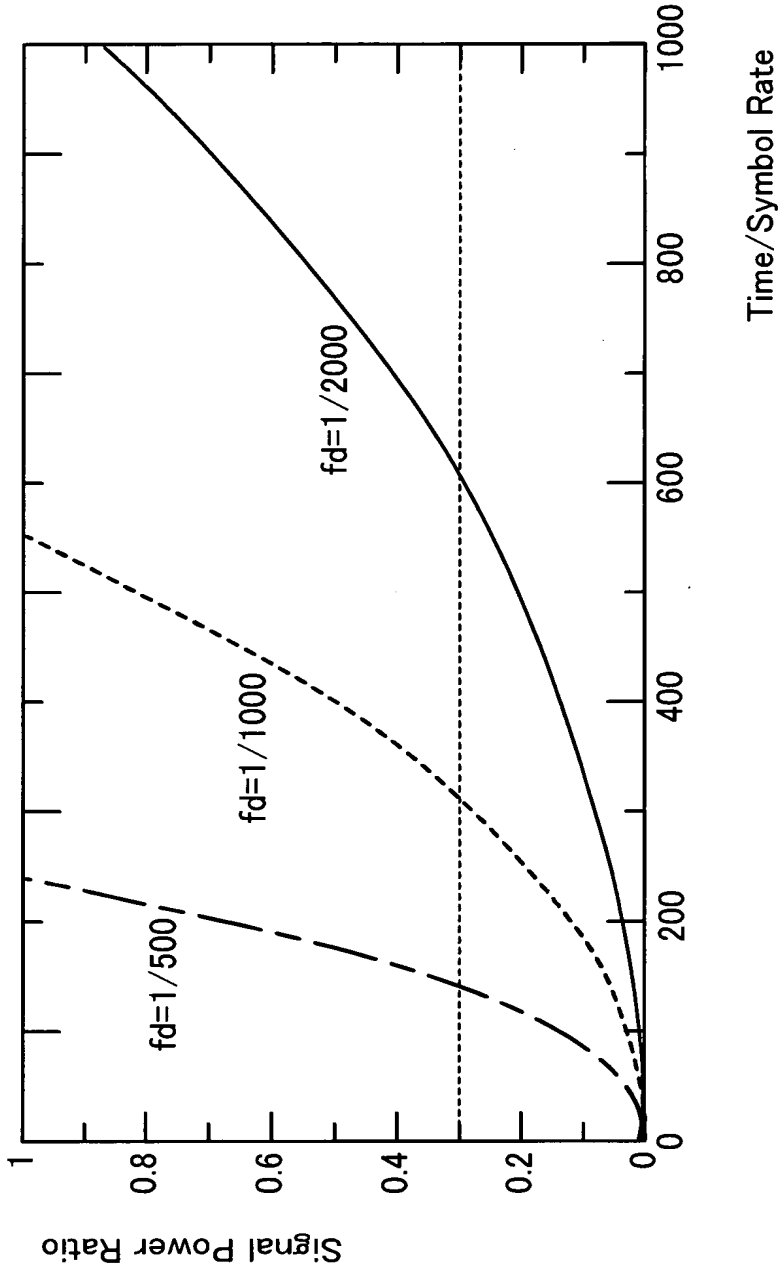
Signal Power Ratio
1
0.8
0.6
0.4
0.2
0
0
200
400
600
800
1000
Time/Symbol Rate
fd=1/2000
fd=1/1000
fd=1/500

FIG.72

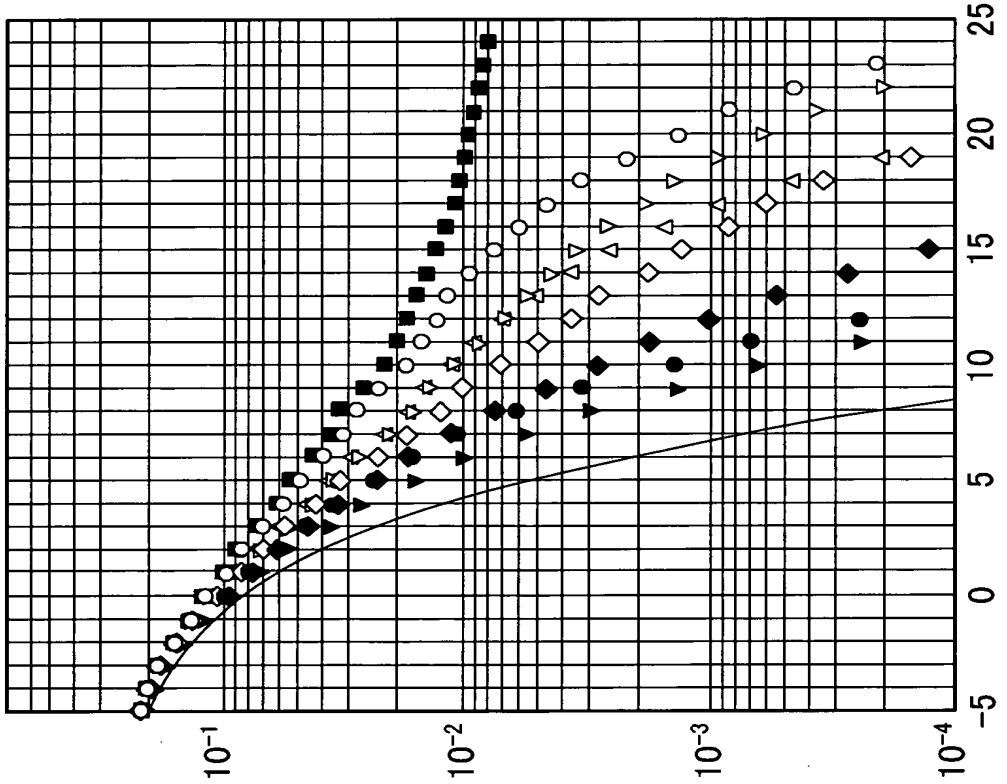

FIG.73

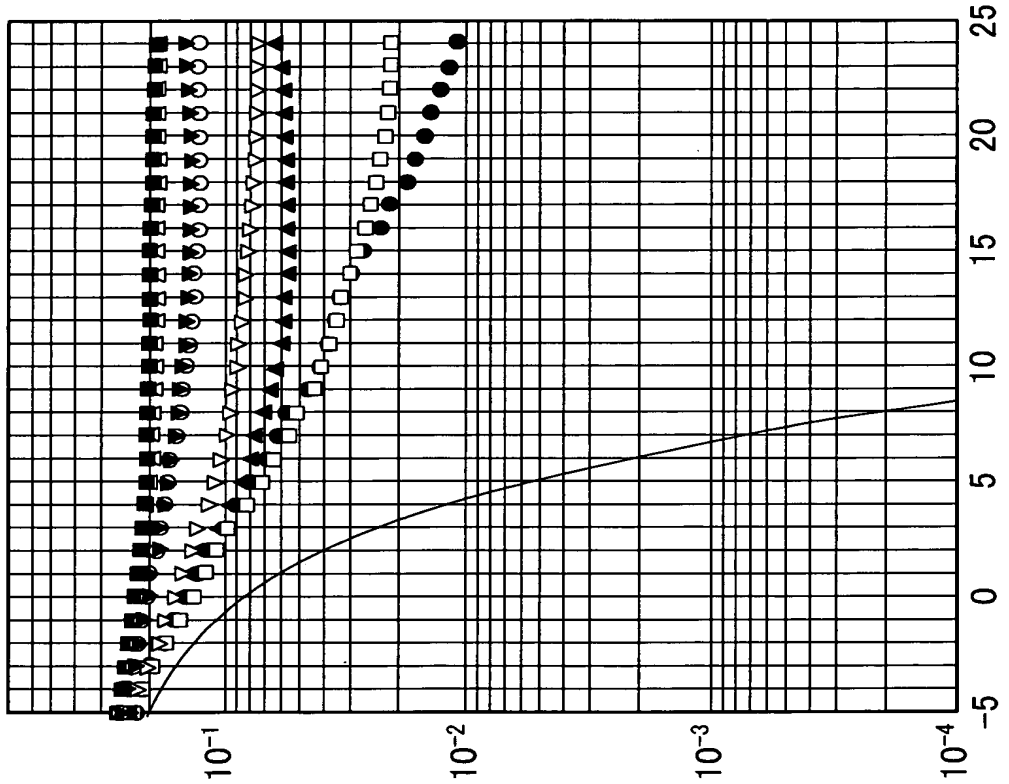

FIG.74

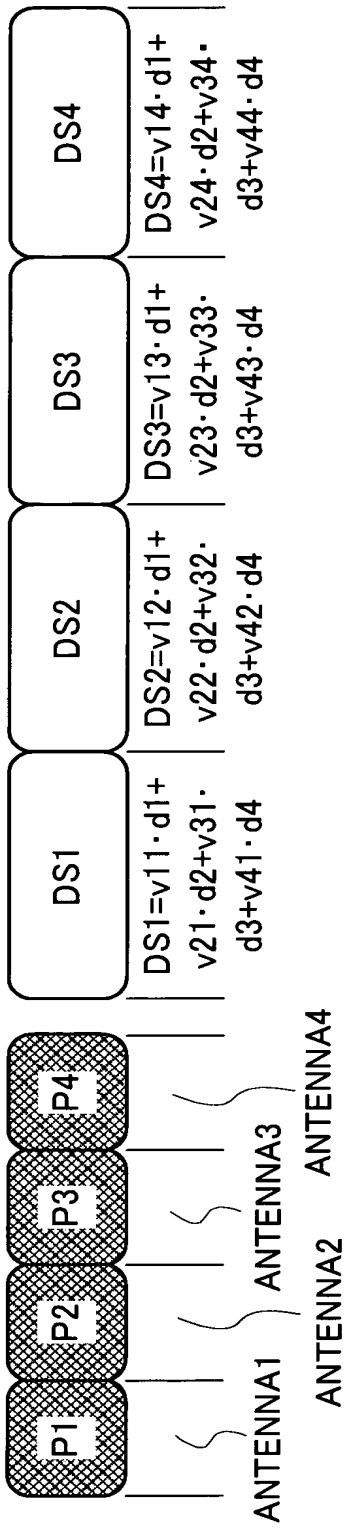
DS1
DS2
DS3
DS4
DS1=v11·d1+ v21·d2+v31· d3+v41·d4
DS2=v12·d1+ v22·d2+v32· d3+v42·d4
DS3=v13·d1+ v23·d2+v33· d3+v43·d4
DS4=v14·d1+ v24·d2+v34· d3+v44·d4
P1
P2
P3
P4
ANTENNA1
ANTENNA2
ANTENNA3
ANTENNA4

FIG.75

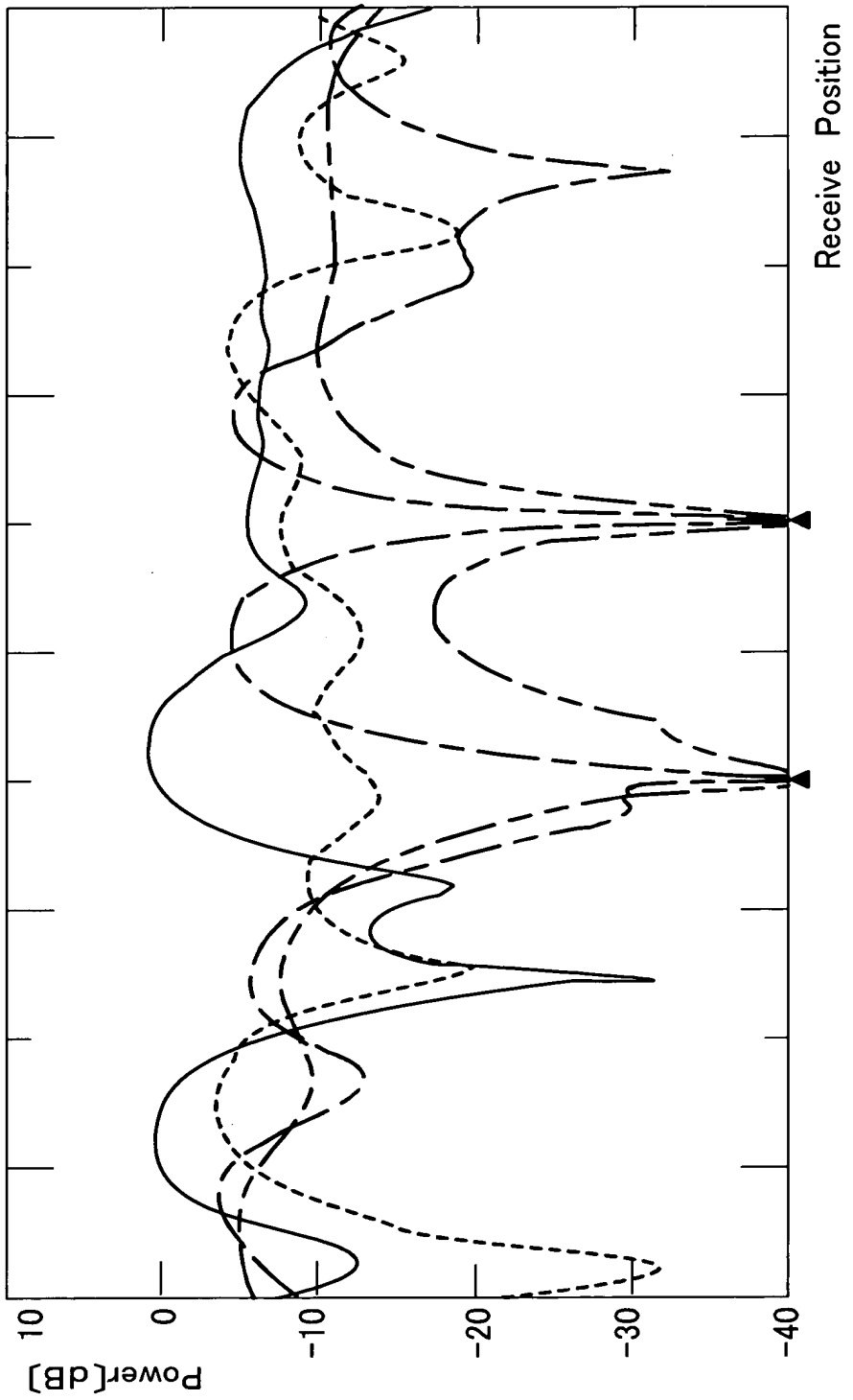

FIG.76

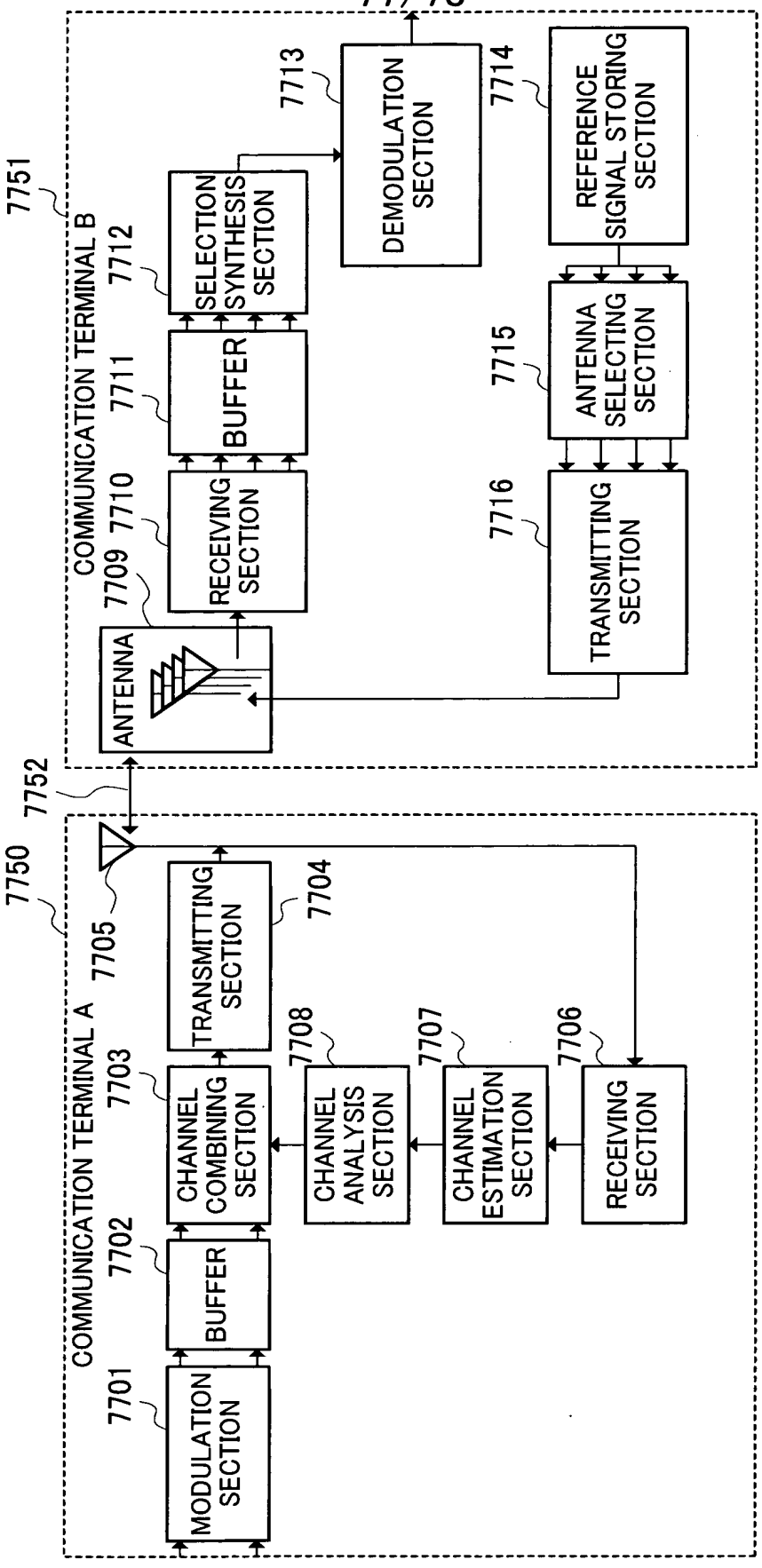
7751
COMMUNICATION TERMINAL B
7709
ANTENNA
7710
RECEIVING SECTION
7711
BUFFER
7712
SELECTION SYNTHESIS SECTION
7713
DEMODULATION SECTION
7714
REFERENCE SIGNAL STORING SECTION
7715
ANTENNA SELECTING SECTION
7716
TRANSMITTING SECTION
7752
7750
COMMUNICATION TERMINAL A
7705
7704
TRANSMITTING SECTION
7703
CHANNEL COMBINING SECTION
7708
CHANNEL ANALYSIS SECTION
7707
CHANNEL ESTIMATION SECTION
7706
RECEIVING SECTION
7702
BUFFER
7701
MODULATION SECTION

FIG.77

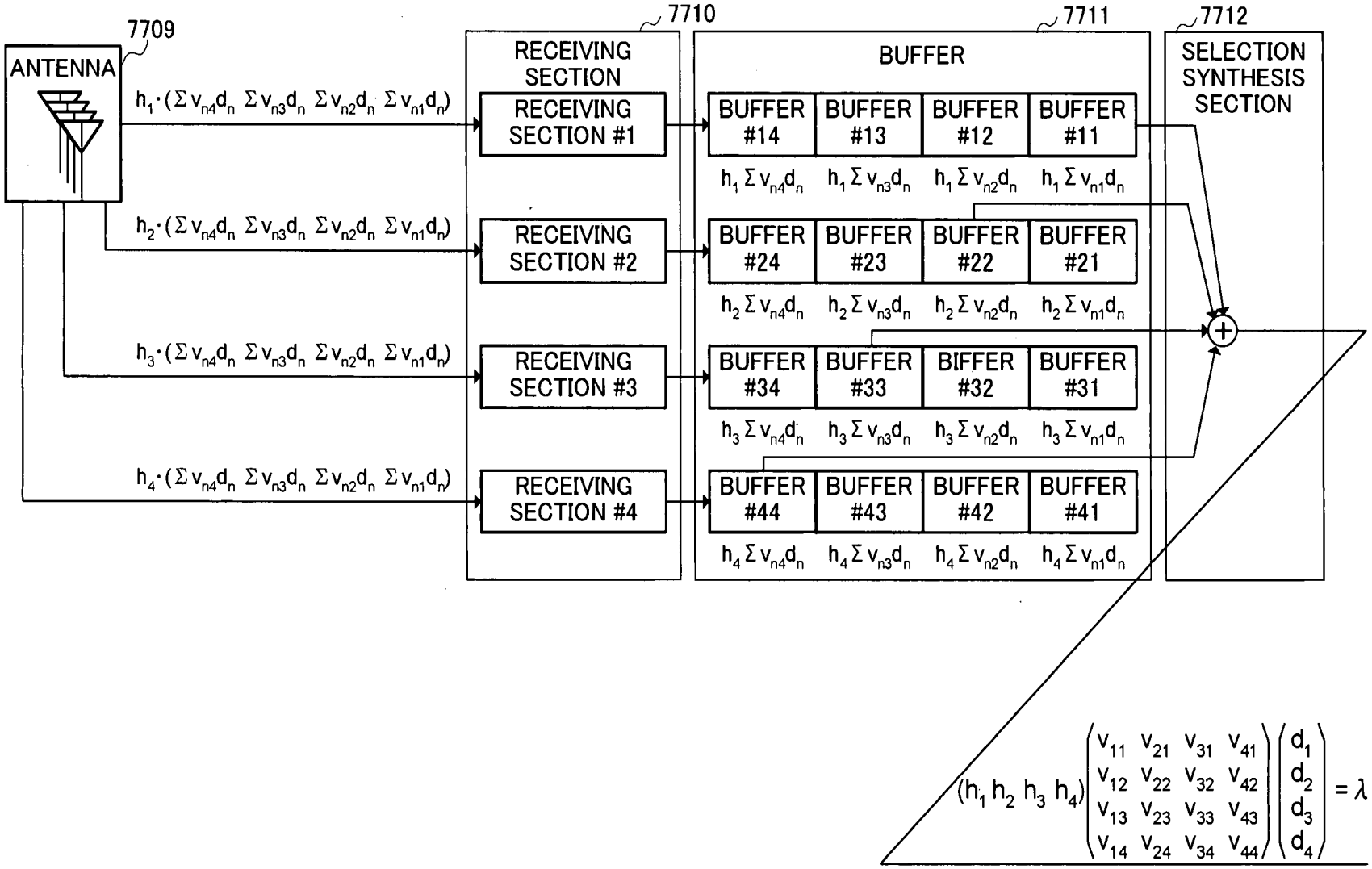

FIG.78

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